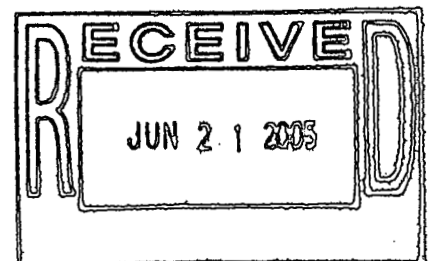


**Draft Closeout Report
for IHSS Group 500-3
UBC 559 – Service Analytical Laboratory,
UBC 528 – Temporary Waste Holding Building,
IHSS 500-159 – Radioactive Site, Building 559,
and Portions of IHSS 000-121, including
Tank 7 and Tanks 33, 34, & 35**



ADMIN RECORD

June 2005

IA-A-002725

1/90

**Draft Closeout Report
for IHSS Group 500-3
UBC 559 – Service Analytical Laboratory,
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Tank 7 and Tanks 33, 34, & 35**

Approval received from the Colorado Department of Public Health and Environment

().

Approval letter contained in the Administrative Record.

June 2005

TABLE OF CONTENTS

1.0 INTRODUCTION	1
2.0 SITE CHARACTERIZATION.....	3
2.1 Site History and Historical Data	3
2.1.1 UBC 559 – Service Analytical Laboratory	3
2.1.2 UBC 528 – Temporary Waste Holding Building	5
2.1.3 IHSS 500-159 – Radioactive Site, Building 559	6
2.1.4 IHSS 000-121 – Tank 7 - OPWL Process Waste Pit	6
2.1.5 IHSS 000-121 – OPWL Tanks 33, 34, and 35.....	7
2.2 Accelerated Action Characterization Data.....	7
2.3 SORs	35
3.0 ACCELERATED ACTION.....	37
3.1 Evaluation of WRW AL Exceedances.....	38
3.2 RAOs and Accelerated Action Goals	39
3.3 D&D Activities	40
3.4 Accelerated Action Soil Removal Activities	40
4.0 CONFIRMATION SAMPLING	42
5.0 RCRA UNIT CLOSURE	45
6.0 POST-ACCELERATED ACTION CONDITIONS	45
7.0 SSRS	45
8.0 STEWARDSHIP EVALUATION.....	49
8.1 Current Site Conditions.....	49
8.2 Near-Term Management Recommendations	50
8.3 Long-Term Stewardship Recommendations.....	50
9.0 DEVIATIONS FROM THE ER RSOP	51
10.0 WASTE MANAGEMENT	51
11.0 SITE RECLAMATION	51
12.0 NLR SAMPLING LOCATIONS	51
13.0 DQA.....	52
13.1 DQA Process.....	52
13.2 V&V of Results.....	53
13.2.1 Accuracy	54
13.2.2 Precision.....	62
13.2.3 Completeness	66
13.2.4 Sensitivity	67
13.3 Summary of Data Quality	67
14.0 CONCLUSIONS.....	67
15.0 REFERENCES	67

3/

LIST OF FIGURES

Figure 1	IHSS Group 500-3 Location	2
Figure 2	IHSS Group 500-3 Preaccelerated Action Soil Sampling Results Greater Than MDLs or Background Means Plus Two Standard Deviations.....	4
Figure 3	IHSS Group 500-3 Surface Soil Results Greater Than RLs or Background Means Plus Two Standard Deviations	31
Figure 4	IHSS Group 500-3 Subsurface Soil Results Greater Than RLs or Background Means Plus Two Standard Deviations – UBC 559.....	32
Figure 5	IHSS Group 500-3 Subsurface Soil Results Greater Than RLs or Background Means Plus Two Standard Deviations – Outside of UBC 559...	33
Figure 6	IHSS Group 500-3 Features Removed and Remaining	41
Figure 7	IHSS Group 500-3 Excavation Boundaries and Confirmation Sampling Data Greater Than Background Means Plus Two Standard Deviations	43
Figure 8	IHSS Group 500-3 Surface Soil Residual Contamination Greater Than RLs or Background Means Plus Two Standard Deviations.....	46
Figure 9	IHSS Group 500-3 Subsurface Soil Residual Contamination Greater Than RLs or Background Means Plus Two Standard Deviations – UBC 559.....	47
Figure 10	IHSS Group 500-3 Subsurface Soil Residual Contamination Greater Than RLs or Background Means Plus Two Standard Deviations – Outside of UBC 559	48

LIST OF TABLES

Table 1	IHSS Group 500-3 Sampling and Analysis Summary.....	7
Table 2	IHSS Group 500-3 Sampling and Analysis Specifications and Deviations from the IASAP Addendum.....	8
Table 3	IHSS Group 500-3 Results Greater Than RLs or Background Means Plus Two Standard Deviations.....	19
Table 4	IHSS Group 500-3 Surface Soil Summary Statistics.....	34
Table 5	IHSS Group 500-3 Subsurface Soil Summary Statistics	34
Table 6	IHSS Group 500-3 Radionuclide SORs.....	36
Table 7	IHSS Group 500-3 Nonradionuclide SORs for Surface Soil Samples	37
Table 8	IHSS Group 500-3 Accelerated Action Activities.....	37
Table 9	IHSS Group 500-3 Historical and Accelerated Action WRW AL Exceedances in Soil.....	38

4/

Table 10	IHSS Group 500-3 Confirmation Sampling Results Greater Than RLs or Background Means Plus Two Standard Deviations.....	44
Table 11	Confirmation Sample Radionuclide SORs	45
Table 12	IHSS Group 500-3 Accelerated Action Slab and Soil Waste Removal Summary	51
Table 13	NLR Sampling Locations.....	52
Table 14	LCS Summary	55
Table 15	LCS Evaluation Summary.....	57
Table 16	Surrogate Recovery Summary	59
Table 17	Field Blank Summary	59
Table 18	Sample MS Evaluation Summary	61
Table 19	Sample MSD Evaluation Summary	63
Table 20	Field Duplicate Sample Frequency Summary.....	65
Table 21	RPD Evaluation Summary	65
Table 22	Validation and Verification Summary	66

LIST OF APPENDICES

Appendix A – Correspondence

Appendix B – Project Photographs

ENCLOSURE

Compact Disc – IHSS Group 500-3 Accelerated Action Data

5/

ACRONYMS AND ABBREVIATIONS

AAESE	Accelerated Action Ecological Screening Evaluation
AL	action level
ALARA	as low as reasonably achievable
AR	Administrative Record
ASD	Analytical Services Division
B	validation code - possible laboratory contamination
B1	verification code - possible laboratory contamination
bgs	below ground surface
BMP	best management practice
BZ	Buffer Zone
CAD/ROD	Corrective Action Decision/Record of Decision
CAS	Chemical Abstracts Service
CD	compact disc
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHWA	Colorado Hazardous Waste Act
CMS/FS	Corrective Measures Study/Feasibility Study
COC	contaminant of concern
cpm	counts per minute
CRA	Comprehensive Risk Assessment
D&D	Decontamination and Decommissioning
DOE	U.S. Department of Energy
DQA	Data Quality Assessment
DQO	data quality objective
EMC	Elevated Measurements Comparison
EPA	U.S. Environmental Protection Agency (same as USEPA)
ER	Environmental Restoration
ER RSOP	Environmental Restoration RFCA Standard Operating Protocol for Routine Soil Remediation
FB	field blank
ft	feet
ft ²	square feet
HPGe	high-purity germanium
HRR	Historical Release Report
HVAC	heating, ventilation, and air conditioning
IA	Industrial Area
IABZSAP	Industrial Area and Buffer Zone Sampling and Analysis Plan
IASAP	Industrial Area Sampling and Analysis Plan
IHSS	Individual Hazardous Substance Site
IM/IRA	Interim Measure/Interim Remedial Action
IML	Intermodal container
ISOCs	In-Situ Counting System

6/

J	validation code - estimated
J1	verification code - estimated
K-H	Kaiser-Hill Company, L.L.C.
LCS	laboratory control sample
LLW	low-level waste
MDL	method detection limit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
µg/kg	micrograms per kilogram (may be found as ug/kg)
µg/L	micrograms per liter (may be found as ug/L)
MS	matrix spike
MSD	matrix spike duplicate
NA	not applicable
nCi/g	nanocuries per gram
NFAA	No Further Accelerated Action
NLR	no longer representative
NPWL	New Process Waste Lines
OPWL	Original Process Waste Lines
PAH	polynuclear aromatic hydrocarbon
PARCCS	precision, accuracy, representativeness, completeness, comparability, and sensitivity
PCB	polychlorinated biphenyl
pCi/g	picocuries per gram
pCi/L	picocuries per liter
PVC	polyvinyl chloride
QC	quality control
R	validation code - rejected
R1	verification code - rejected
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RFCA	Rocky Flats Cleanup Agreement
RFETS or Site	Rocky Flats Environmental Technology Site
RFI/RI	RCRA Facility Investigation/Remedial Investigation
RIN	report identification number
RL	reporting limit
RNS	rinse blank
RPD	relative percent difference
RSOP	RFCA Standard Operating Protocol
SAP	Sampling and Analysis Plan
SOR	sum of ratios
SSRS	Subsurface Soil Risk Screen
SWD	Soil Water Database
TB	trip blank
TRU	transuranic
U	validation code - below laboratory detection limit
U1	verification code - below laboratory detection limit

7/

UBC	Under Building Contamination
USEPA	U.S. Environmental Protection Agency (same as EPA)
V&V	verification and validation
VOC	volatile organic compound
WRW	wildlife refuge worker
WSRIC	Waste Stream and Residue Identification and Characterization

8/

EXECUTIVE SUMMARY

This Closeout Report summarizes accelerated action activities conducted at Individual Hazardous Substance Site (IHSS) Group 500-3, which consists of Under Building Contamination Site (UBC) 559 – Service Analytical Laboratory; UBC 528 – Temporary Waste Holding Building; IHSS 500-159 – Radioactive Site, Building 559; and portions of IHSS 000-121, including Tanks 7 and Tanks 33, 34, and 35. Accelerated action activities were planned and executed in accordance with the Industrial Area (IA) Sampling and Analysis Plan (SAP) (IASAP) (DOE 2001), the Environmental Restoration (ER) Rocky Flats Cleanup Agreement (RFCA) Standard Operating Protocol (RSOP) for Routine Soil Remediation (ER RSOP) Modification 2 (DOE 2004a), IASAP Addendum #IA-03-12 (DOE 2003a), and ER RSOP Notification #05-02 (DOE 2005a).

Accelerated action activities were conducted between October 13, 2003 and May 26, 2005, and included soil characterization, removal, and confirmation sampling. Associated Decontamination and Decommissioning (D&D) activities included removal of the Building 559 slab and footers; Building 528 Pit; and all Original Process Waste Lines (OPWL), New Process Waste Lines (NPWL), sanitary sewers, and storm drains beneath and adjacent to Buildings 559 and 528. The majority of planned characterization samples were collected in August and September 2004. D&D and further characterization sampling took place from January through April 2005. Soil remediation and confirmation sampling occurred in March and April 2005.

Historical and accelerated action characterization data indicated contaminant activities and concentrations in soil greater than wildlife refuge worker (WRW) action levels (ALs) included plutonium-239/240 and americium-241 in surface soil at one location beneath Room 130 of Building 559, and benzo(a)pyrene in one historical surface soil sample collected near Building 528. Two additional areas of radionuclide exceedance were identified in subsurface soil adjacent to the Building 559 air tunnel and beneath a manway that was removed between Buildings 559 and 528.

Soil at the Room 130 hot spot location was partially excavated prior to complete removal of the Building 559 slab, and was further excavated after slab removal. The two other hot spots with plutonium-239/240 activities exceeding the WRW AL were both deeper than 3 feet (ft) below the final grade and did not require remediation under RFCA. However, both were excavated as a best management practice (BMP) and confirmation samples were collected to demonstrate the effectiveness of the remediation.

Following D&D and soil removal activities, the Building 528 and Building 559 excavations were backfilled with clean fill and the area was regraded and reseeded. Residual contamination at levels less than the WRW ALs (but greater than reporting limits [RLs] or background means plus two standard deviations) remains in surface and subsurface soil in the area.

No Further Accelerated Action (NFAA) is warranted for soil at IHSS Group 500-3. All ER RSOP remedial action objectives (RAOs) (DOE 2005a) and accelerated action goals established for remediation of IHSS Group 500-3 soil were achieved. The soil removal activities conducted at IHSS Group 500-3 contributed to the protection of human health and the environment by

9/

removing potential sources of contamination. As part of the as low as reasonably achievable (ALARA) evaluation process mandated by RFCA, radionuclide contamination in subsurface soil that was exposed during D&D was remediated to the same WRW ALs applicable to surface soil. BMPs were used during removal activities to minimize the potential spread of contamination. The removal activities minimized the need for short- and long-term management actions. The post-remediation Subsurface Soil Risk Screen (SSRS) and stewardship evaluation presented in this document indicate no additional accelerated action is required and NFAA status is warranted for IHSS Group 500-3. Long-term stewardship actions include restricting site access, controlling soil excavation, and prohibiting groundwater pumping.

10/

1.0 INTRODUCTION

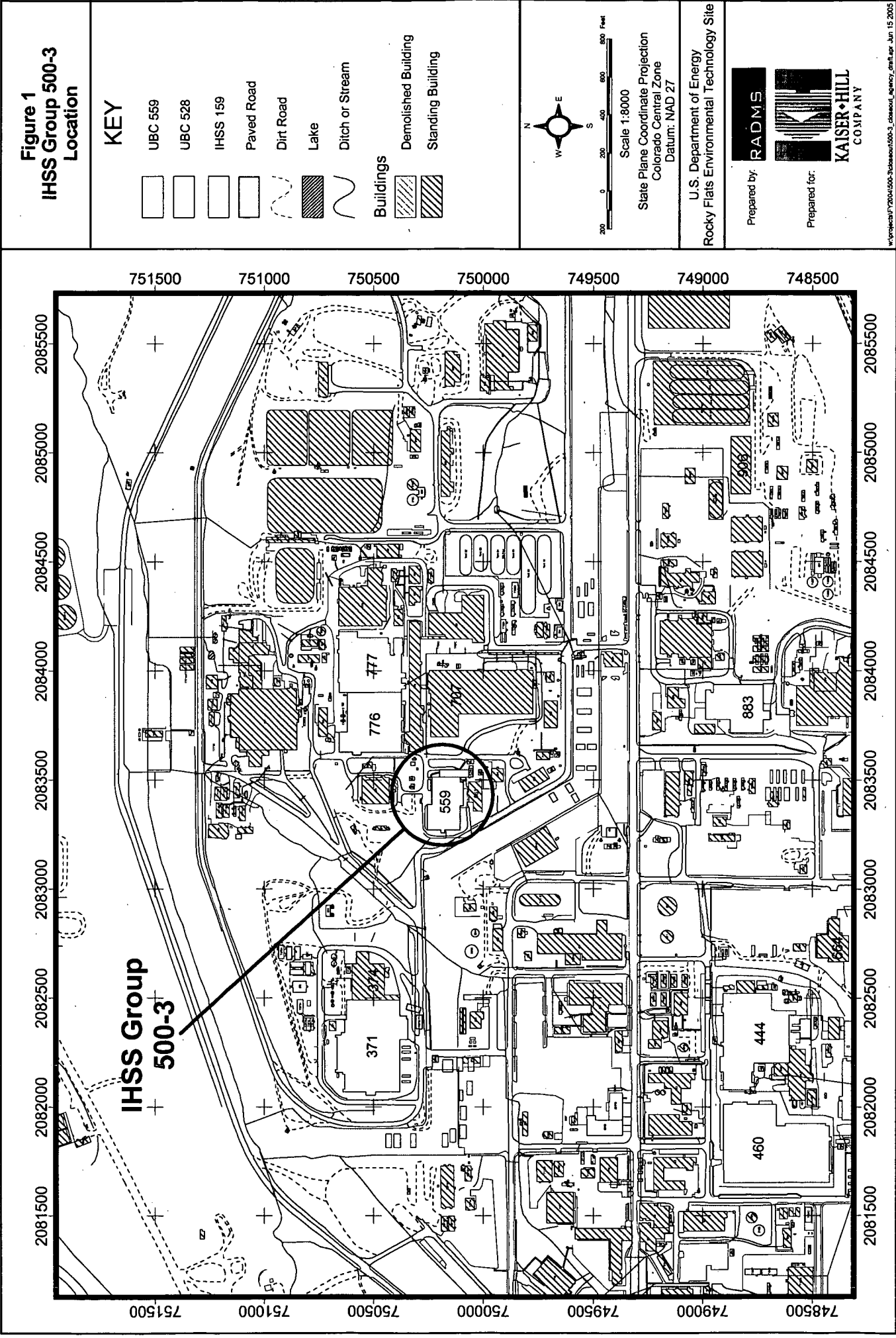
This Closeout Report documents the accelerated action activities conducted at Individual Hazardous Substance Site (IHSS) Group 500-3, located at the U.S. Department of Energy's (DOE's) Rocky Flats Environmental Technology Site (RFETS or Site) near Golden, Colorado, and demonstrates attainment of the cleanup goals stipulated for IHSS Group 500-3. Figure 1 shows the location of IHSS Group 500-3 at RFETS. IHSS Group 500-3 consists of Under Building Contamination Site (UBC) 559 – Service Analytical Laboratory; UBC 528 – Temporary Waste Holding Building; IHSS 500-159 –Radioactive Site, Building 559; and portions of IHSS 000-121, including Tanks 7 and Tanks 33, 34, and 35.

The accelerated action activities conducted at IHSS Group 500-3 were planned and conducted in accordance with the Industrial Area (IA) Sampling and Analysis Plan (SAP) (IASAP) (DOE 2001) and the Environmental Restoration (ER) Rocky Flats Cleanup Agreement (RFCA) Standard Operating Protocol (RSOP) for Routine Soil Remediation (ER RSOP) Modification 2 (DOE 2004a). Accelerated action characterization activities were conducted in accordance with IASAP Addendum #IA-03-12 (DOE 2003a). Accelerated action soil removal activities were conducted in accordance with ER RSOP Notification #05-02 (DOE 2005a).

This IHSS Group 500-3 Closeout Report includes the following:

- Historical information;
- Deviations from IASAP Addendum #IA-03-12 sampling specifications (DOE 2003a);
- Characterization data presented in tables and shown on maps;
- Sums of ratios (SORs) and summary statistics for the accelerated action data;
- Evaluation of historical and accelerated action data greater than wildlife refuge worker (WRW) action levels (ALs);
- Remedial action objectives (RAOs) and accelerated action goals;
- Description of accelerated action activities;
- Confirmation sampling results;
- Map of the remediated areas including excavation boundaries and confirmation sampling results;
- Subsurface Soil Risk Screen (SSRS);
- Stewardship evaluation;
- Deviations from the ER RSOP;

12/



- Maps of residual soil contamination exceeding reporting limits (RLs) for organics and background means plus two standard deviations for inorganics;
- Disposition of waste and site reclamation;
- Table of sampling locations that are no longer representative (NLR) because of being remediated;
- Data Quality Assessment (DQA);
- Conclusions;
- References;
- Contact records;
- A compact disc (CD) containing the accelerated action data set for the project with real and quality control (QC) data in separate files.

Approval of this Closeout Report constitutes regulatory agency concurrence that IHSS Group 500-3 is a No Further Accelerated Action (NFAA) site. This information and NFAA determination will be documented in the 2005 Historical Release Report (HRR) (DOE 2005b). This Closeout Report and associated documentation will be retained in the RFETS Administrative Record (AR).

2.0 SITE CHARACTERIZATION

IHSS Group 500-3 has been characterized based on site history, historical data, and accelerated action sampling data.

2.1 Site History and Historical Data

The following historical information on IHSS Group 500-3 is summarized from the 1992 HRR (DOE 1992), IASAP (DOE 2001), and IA Data Summary Report (DOE 2000).

Figure 2 presents historical soil results greater than method detection limits (MDLs) or background means plus two standard deviations. The only WRW AL exceedance is for benzo(a)pyrene in surface soil at a location near Building 528. This exceedance occurs outside the footprints of the IHSS and UBC areas that make up IHSS Group 500-3 but is in the immediate vicinity. Asphalt pavement is present in the area of the exceedance and is considered the likely source of the benzo(a)pyrene.

2.1.1 UBC 559 – Service Analytical Laboratory

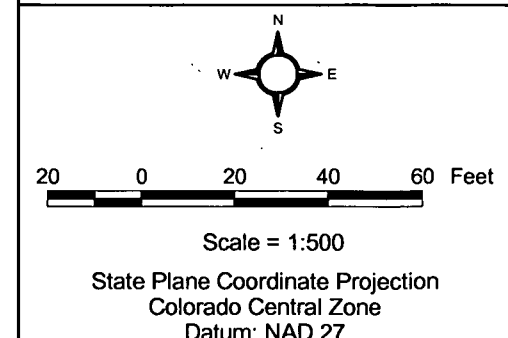
Building 559, Service Analytical Laboratory, was constructed in 1967 and began operations in January 1968. Both the Production Support and Plant Support laboratories were located in the building, which housed facilities for conducting spectrochemical, chemical, and mass spectrometric analyses on samples of recovered, cast, and purified materials from the Plant. The

Figure 2
IHSS Group 500-3 Preaccelerated
Action Soil Sampling Results Greater
Than MDLs or Background Means
Plus Two Standard Deviations

KEY

- Sampling location with results greater than WRW AL
- Sampling location with results greater than RLs or background means plus two standard deviations
- Sampling location with all results less than RLs or background means plus two standard deviations
- Original Process Waste Lines
- New Process Waste Lines
- UBCs 559 and 528
- IHSS 159
- Demolished Building
- Standing Building
- Asphalt
- Dirt Roads
- Building 559 Floor Plan

DRAFT

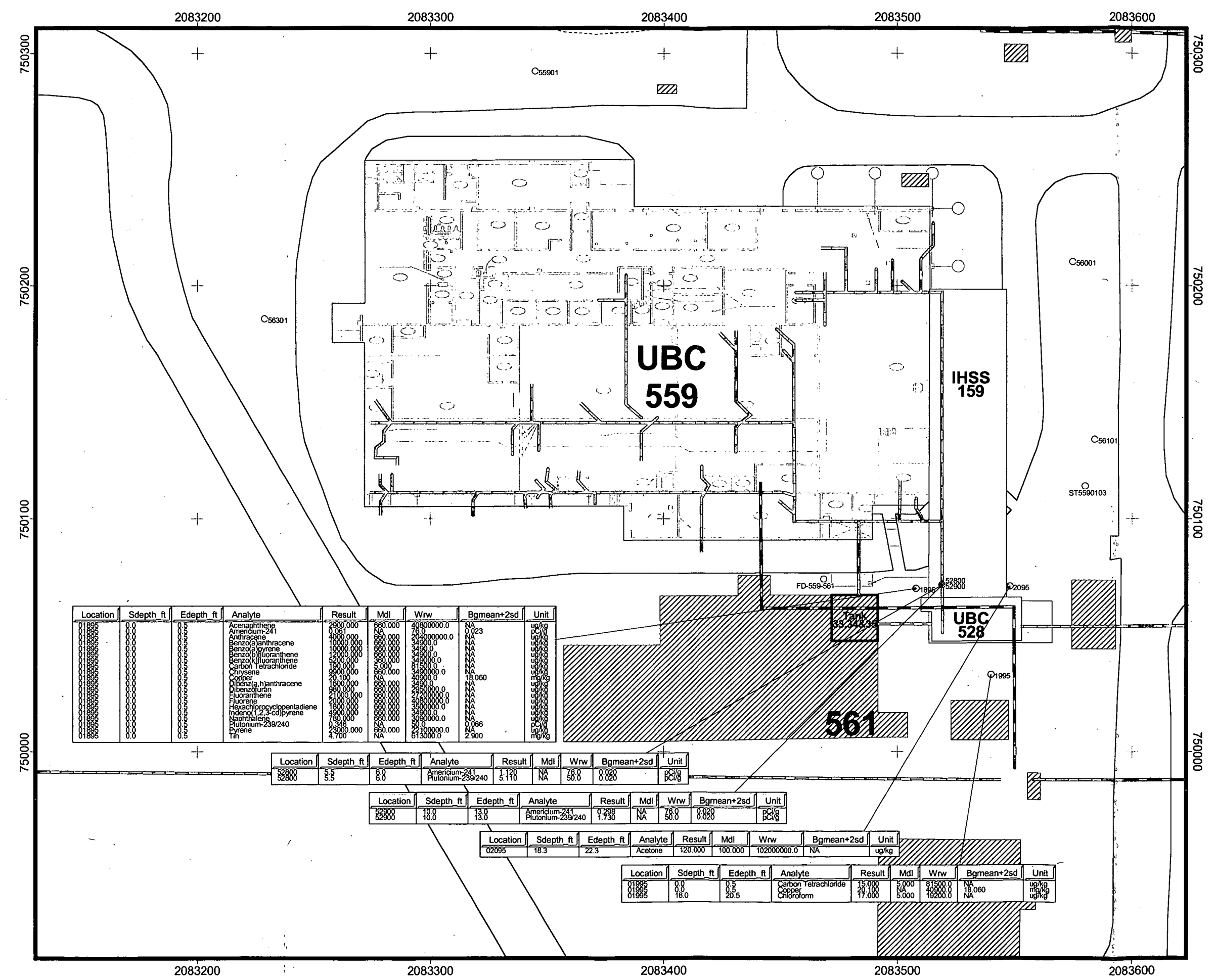


U.S. Department of Energy
Rocky Flats Environmental Technology Site

Date: 06/15/05

Prepared by: **RADMS**

Prepared for: **KAISER HILL COMPANY**



Location	Sdepth ft	Edepth ft	Analyte	Result	Mdl	Wrw	Bgmean+2sd	Unit
01895	0.0	0.0	Acenaphthene	2300.000	560.000	40800000.0	NA	ug/kg
01895	0.0	0.0	Amercium-241	0.061	NA	76.0	0.023	pci/g
01895	0.0	0.0	Anthracene	1000.000	560.000	40800000.0	NA	ug/kg
01895	0.0	0.0	Benzo(a)anthracene	1000.000	560.000	40800000.0	NA	ug/kg
01895	0.0	0.0	Benzo(a)pyrene	1000.000	560.000	40800000.0	NA	ug/kg
01895	0.0	0.0	Benzo(b)fluoranthene	1000.000	560.000	40800000.0	NA	ug/kg
01895	0.0	0.0	Benzo(k)fluoranthene	1000.000	560.000	40800000.0	NA	ug/kg
01895	0.0	0.0	Carbon tetrachloride	1000.000	560.000	40800000.0	NA	ug/kg
01895	0.0	0.0	Chrysene	1000.000	560.000	40800000.0	NA	ug/kg
01895	0.0	0.0	Copper	1000.000	560.000	40800000.0	18.060	mg/kg
01895	0.0	0.0	Dibenz(a,h)anthracene	1000.000	560.000	40800000.0	NA	ug/kg
01895	0.0	0.0	Dibenzofuran	1000.000	560.000	40800000.0	NA	ug/kg
01895	0.0	0.0	Fluoranthene	1000.000	560.000	40800000.0	NA	ug/kg
01895	0.0	0.0	Fluorene	1000.000	560.000	40800000.0	NA	ug/kg
01895	0.0	0.0	Hexachlorocyclopentadiene	1000.000	560.000	40800000.0	NA	ug/kg
01895	0.0	0.0	Indeno(1,2,3-cd)pyrene	1000.000	560.000	40800000.0	NA	ug/kg
01895	0.0	0.0	Naphthalene	1000.000	560.000	40800000.0	NA	ug/kg
01895	0.0	0.0	Plutonium-239/240	0.346	NA	50.0	0.066	pci/g
01895	0.0	0.0	Pyrene	2300.000	560.000	40800000.0	NA	ug/kg
01895	0.0	0.0	Tin	4.700	NA	613000.0	2.900	mg/kg

Location	Sdepth ft	Edepth ft	Analyte	Result	Mdl	Wrw	Bgmean+2sd	Unit
52800	5.5	6.0	Amercium-241	1.120	NA	76.0	0.020	pci/g
52800	5.5	6.0	Plutonium-239/240	5.110	NA	50.0	0.020	pci/g

Location	Sdepth ft	Edepth ft	Analyte	Result	Mdl	Wrw	Bgmean+2sd	Unit
52900	10.0	13.0	Amercium-241	0.498	NA	76.0	0.020	pci/g
52900	10.0	13.0	Plutonium-239/240	1.730	NA	50.0	0.020	pci/g

Location	Sdepth ft	Edepth ft	Analyte	Result	Mdl	Wrw	Bgmean+2sd	Unit
02095	18.3	22.3	Acetone	120.000	100.000	102000000.0	NA	ug/kg

Location	Sdepth ft	Edepth ft	Analyte	Result	Mdl	Wrw	Bgmean+2sd	Unit
01995	0.0	0.5	Carbon Tetrachloride	15.000	5.000	81500.0	NA	ug/kg
01995	0.0	0.5	Copper	20.100	5.000	40800.0	18.060	mg/kg
01995	18.0	20.5	Chloroform	17.000	5.000	19200.0	NA	ug/kg

northern side of the building contained offices, radiation monitoring, a computer room, restrooms, a locker room, store rooms, and maintenance equipment. Four large bays in the remainder of the building housed laboratories as well as mechanical equipment.

The footprint area of Building 559 was approximately 35,000 square feet (ft²). An east-west tunnel approximately 12 feet (ft) wide and 200 ft long ran beneath the laboratory bays in the southern portion of the building. A north-south tunnel approximately 13 ft wide and 30 ft long connected the southeastern portion of Building 559 with the northeastern portion of Building 561, which housed filter plenums for Building 559. Air ducts constructed of transite pipe were present beneath the Building 559 slab (refer to RFETS Drawing 39410-105 M).

Specific laboratories included the spectrochemical analysis laboratory, chemistry laboratory, and mass spectroscopy laboratory. Radioactive materials were received and shipped from a loading dock on the south side of the building. A second loading dock at the western end of the building received other building supplies. The Production Support laboratory performed quantitative and qualitative chemical analyses for plutonium operations to ensure that raw materials, produced materials, and final products conformed to specifications. Samples consisted chiefly of plutonium and plutonium alloys, other metals and their alloys, plutonium and uranium oxides, solutions of plutonium and other elements, and various gases. Quantitative analyses included gallium in plutonium alloy, plutonium assay, carbon-hydrogen-nitrogen content, ion analysis, tritium content, emission spectrometric analysis, atomic absorption, coulometric analysis, x-ray fluorescence spectroscopy, and identification of various isotopes.

The Plant Support laboratory performed analyses on materials for functions indirectly related to production (for example, radiation monitoring and waste treatment). Specific tasks included Raschig ring analysis and certification, duct remediation, polychlorinated biphenyl (PCB) analysis, and low-level waste (LLW) characterization. Construction of Building 561 in 1973—expanded the capabilities of the laboratory. Later projects included the Waste Isolation Pilot Project Bin and Alcove test program, the Waste Stream and Residue Identification and Characterization (WSRIC) program, and consolidation and stabilization of nuclear materials. This group performed mass spectrometry analyses of isotopes of plutonium, uranium, lithium, and boron (thermal ionization), as well as organic compounds and gases. Other analyses included infrared analysis for impurities, thermal characterization analysis to determine phase changes as a function of temperature, and titrimetry to determine the water content of organic solvents.

The facility was originally built with Pyrex glass process waste lines. As discussed more thoroughly in Section 2.1.3, several documented releases occurred as a result of breakage of the glass lines.

2.1.2 UBC 528 – Temporary Waste Holding Building

Constructed in 1969, Building 528 was a below-grade concrete vault structure holding two 2,000-gallon in-sump steel tanks designed to receive process waste from Building 559 (see Tank 7 below). These wastes were mainly aqueous solutions of hydrochloric acid, nitric acid, sulfuric acid, potassium hydroxide, detergent, radionuclides, and metals. Pesticides, herbicides, and PCBs may have been present as constituents of samples analyzed. Waste was held in the Building 528 tanks until it was pumped to Building 374 for treatment.

15/

2.1.3 IHSS 500-159 – Radioactive Site, Building 559

When Building 559 began operation, the process waste lines installed beneath the building and adjacent support buildings were made of Pyrex glass. The glass lines proved to be too brittle to withstand the strain imposed by the normal settling and shifting of the new building, and broken lines led to releases of process waste to the surrounding soil. IHSS 500-159 is a 5,400-ft² area east of Building 559 where radioactive soil associated with Original Process Waste Lines (OPWL) breaks was excavated and removed.

In 1968, less than a year after Building 559 began operation, a break was discovered in the process waste line from the building to the pump house. In response to the 1968 incident, an area of several hundred square feet was excavated and contaminated soil was removed and disposed of off site (DOE 1992).

In May 1972, a process waste line beneath Building 559 was discovered to be leaking, and the rupture of the process waste line from Building 559 to the process waste tank valve pit caused soil contamination with a gross activity of 4,500 picocuries per gram (pCi/g). The specific radionuclides associated with this activity were not reported. The contamination decreased from the pit to the concrete pad along the southern side of Building 559. As a result, polyvinyl chloride (PVC) pipe was installed to bypass the Pyrex line beneath the southern half of Building 559, and the remaining lines were static leak tested. In addition, 82 drums of contaminated soil were removed from above and horizontally adjacent to the process waste line from Building 559 to the process waste tank pit south of the building, and the pit building (Building 528) was decontaminated. The soil beneath the process waste line was not removed. Building 559 suspended generation of process waste water, and groundwater was pumped from the footing manhole to the process waste holding tanks. No documentation was found that indicated the duration for which process waste generation was suspended (DOE 1992).

In May 1977, "contaminated" groundwater was discovered in the manhole next to the southwestern corner of Building 559. The contamination was believed to be the residue of contamination released in 1972. Also in May 1977, 4,600 gallons of contaminated water leaked into a process waste collection tank in Building 528. The water leaked through a drip leg of the double-contained process waste lines and was fed by a broken 3-inch PVC process water supply line running from Building 559 to Building 561. Gross alpha radiation in the water from the drip leg was measured at 160,000 picocuries per liter (pCi/L). It was concluded that the process water supply line, process waste line, and shell of the process waste line were probably broken. The primary material of concern was process waste generated at Building 559 (DOE 1992).

2.1.4 IHSS 000-121 – Tank 7 - OPWL Process Waste Pit

Tank 7 consists of two 2,000-gallon, in-sump steel tanks that are housed in Building 528, also known as the Building 559 Process Waste Pit. Building 528 is located approximately 30 ft southeast of Building 559.

Tank 7 was installed in 1969 and received process waste from Building 559. These wastes were mainly aqueous solutions of hydrochloric acid, nitric acid, sulfuric acid, potassium hydroxide, detergent, radionuclides, and metals. Pesticides, herbicides, and PCBs may have been present as constituents of samples analyzed. If present they would be constituents of a waste mixture expected to contain laboratory solvents, as well as acids and radionuclides. According to

16/

Building 559 personnel, Tank 7 was used as a 90-day transuranic (TRU) waste accumulation tank.

Soil from a borehole drilled adjacent to the northwestern corner of Tank 7 had plutonium-239/240 activities greater than background at a depth of 0.0 to 0.5 ft. A groundwater sample from the same location contained arsenic, barium, chromium, cobalt, copper, lead, lithium, mercury, nickel, selenium, strontium, zinc, gross alpha, gross beta, uranium-235, uranium-233/234, and uranium-238 above background levels. In a groundwater sample at the borehole adjacent to the northeastern corner of Tank 7, arsenic, strontium, manganese, sodium, zinc, uranium-233/234, and uranium-238 exceeded background concentrations (DOE 1992).

2.1.5 IHSS 000-121 – OPWL Tanks 33, 34, and 35

Based on field reconnaissance, it was concluded that these three tanks were a single tank located in the northeastern portion of Building 561. According to the Version 7.0 WSRIC Report, the function of the tank was to hold deluge water in case of a plenum fire in any of the four plenums housed in Building 561. Because this event did not occur, the tank was reportedly never used (DOE 2004b).

2.2 Accelerated Action Characterization Data

Table 1 presents a summary of planned versus actual sampling and analyses for IHSS Group 500-3. The number "planned" includes all characterization samples specified in IASAP Addendum #IA-03-12, whereas the actual number includes "planned" samples plus additional characterization samples and confirmation samples.

Table 2 presents actual accelerated action sampling specifications, and includes explanations for deviations from IASAP Addendum #IA-03-12 specifications (DOE 2003a). Confirmation samples and supplemental characterization samples not proposed in IASAP Addendum #IA-03-12 are also included.

Table 1
IHSS Group 500-3 Sampling and Analysis Summary

IHSS Group 500-3	Number Planned (per #IA-03-12)	Actual Number
Sampling Locations	31	76
Number of Samples	60	116
Surface Soil Samples	27	24
Subsurface Soil Samples	33	92
Number of Metal Analyses	60	77
Number of Radionuclide Analyses	60	115
Number of VOC Analyses	60	76
Number of Pesticide Analyses	2	2
Number of Herbicide Analyses	2	2
Number of PCB Analyses	2	2

The number of characterization samples was expanded significantly beyond the number proposed in IASAP Addendum #IA-03-12 (DOE 2003a), because additional samples were collected opportunistically during removal of the Building 559 slab and associated OPWL.

17/

Table 2
IHSS Group 500-3 Sampling and Analysis Specifications and Deviations from the IASAP Addendum

Location Code	Actual Northing	Actual Easting	Proposed Northing	Proposed Easting	Actual Media	Actual Depth Interval (ft)	Actual Analytes	Offset Distance (ft) and Direction	Comments
CA42-036	750199.340	2083458.966	NA	NA	Subsurface Soil	0-4.0	Radionuclides	NA	Confirmation sample for UBC 559, Room 130 hot spot excavation, northern sidewall, composite.
CA42-039	750190.136	2083465.145	NA	NA	Subsurface Soil	0-4.0	Radionuclides	NA	Confirmation sample for UBC 559, Room 130 hot spot excavation, eastern sidewall, composite.
CC43-000	750139.060	2083312.670	750138.932	2083320.144	Surface Soil	0-0.4	Metals, Radionuclides, VOCs	7.5 W	Relocated to target OPWL. B interval (0.5-2.5') not sampled due to shallow groundwater.
CC43-001	750118.480	2083285.890	750120.066	2083285.747	Surface Soil	0-0.5	Metals, Radionuclides, VOCs	1.6 S	Relocated to target OPWL. Refusal at 1.0' because of cobbles; however, all analyses were completed.
					Subsurface Soil	0.5-1.0	Metals, Radionuclides, VOCs		
CC43-030	750098.180	2083515.490	750132.021	2083258.184	Subsurface Soil	4.5-6.0	Metals, Radionuclides, VOCs	259.5 SE	Biased sample originally targeted nonexistent OPWL on west side of Building 559. Sample was relocated to target an OPWL near the SE corner of Building 559.
					Subsurface Soil	6.5-7.5	Metals, Radionuclides, VOCs		
CC44-000	750186.640	2083317.370	750196.021	2083315.431	Surface Soil	0-0.5	Metals, Radionuclides, VOCs	9.6 SE	Location biased for coverage. Relocated to avoid sanitary sewer line. Refusal at 0.9' because of cobbles, however all analyses were completed.
					Subsurface Soil	0.5-0.9	Metals, Radionuclides, VOCs		

Location Code	Actual Northing	Actual Easting	Proposed Northing	Proposed Easting	Actual Media	Actual Depth Interval (ft)	Actual Analytes	Offset Distance (ft) and Direction	Comments
CC44-001	750167.950	2083314.200	750165.225	2083314.664	Surface Soil	0-0.5	Metals, Radionuclides, VOCs	2.8 NW	Statistical sample relocated to avoid ventilation duct. Refusal at 1.0' because of cobbles; however, all analyses were completed.
					Subsurface Soil	0.5-1.0	Metals, Radionuclides, VOCs		
CC44-002	750234.370	2083331.520	750235.127	2083331.920	Surface Soil	0-0.5	Metals, Radionuclides, VOCs	<1	Statistical sample. No significant change in location. Refusal at 0.9' because of cobbles; however, all analyses were completed.
					Subsurface Soil	0.5-0.9	Metals, Radionuclides, VOCs		
CC44-003	750173.210	2083266.818	750173.976	2083264.860	Surface Soil	0-0.5	Metals, Radionuclides, VOCs	2.1 SE	Relocated to target West Loading Dock.
CD43-000	750131.995	2083521.803	750138.332	2083521.704	Subsurface Soil	6.5-8.5	Metals, Radionuclides, VOCs	6.3 S	Relocated to avoid HVAC equipment and target OPWL.
CD43-001-01	750075.979	2083537.001	750076.374	2083536.539	Subsurface Soil	6.5-8.5	Metals, Radionuclides, VOCs	<1	Statistical sample. No significant change in location.
CD43-002-01	750080.988	2083519.093	750080.929	2083517.608	Surface Soil	0-0.5	Metals, Radionuclides, VOCs	1.5	Relocated to target OPWL.
					Subsurface Soil	0.5-2.5	Metals, Radionuclides, VOCs		
					Subsurface Soil	6.5-8.5	Metals, Radionuclides, VOCs		
CD43-003	750115.019	2083530.017	750114.782	2083529.854	Surface Soil	0-0.5	Metals, Radionuclides	<1	Statistical sample. No significant change in location. VOCs not analyzed in surface soil because asphalt was present.
					Subsurface Soil	0.5-2.5	Metals, Radionuclides, VOCs		
					Subsurface Soil	6.5-8.5	Metals, Radionuclides, VOCs		
CD43-004	750139.060	2083361.670	750143.907	2083393.471	Surface Soil	0-0.5	Metals, Radionuclides, VOCs	32.2 SW	Relocated to target OPWL in tunnel. Refusal at 0.5' because of cobbles. B interval (0.5-2.5') not sampled.

102

Draft Closeout Report for IHSS Group 500-3

Location Code	Actual Northing	Actual Easting	Proposed Northing	Proposed Easting	Actual Media	Actual Depth Interval (ft)	Actual Analytes	Offset Distance (ft) and Direction	Comments
CD43-005	750103.940	2083461.890	750099.492	2083453.011	Surface Soil	0-0.5	Metals, Radionuclides, VOCs	9.9 NE	Relocated to target OPWL. Refusal at 0.9' because of cobbles; however, all analyses were completed.
					Subsurface Soil	0.5-0.9	Metals, Radionuclides, VOCs		
CD43-006	750159.960	2083449.840	750158.573	2083453.179	Surface Soil	0-0.5	Metals, Radionuclides, VOCs	3.6 NW	Relocated to target OPWL. Refusal at 1.0' because of cobbles; however, all analyses were completed.
					Subsurface Soil	0.5-1.0	Metals, Radionuclides, VOCs		
CD43-007	750116.480	2083377.120	750115.331	2083366.574	Surface Soil	0-0.5	Metals, Radionuclides, VOCs	10.5 E	Statistical sample. Refusal at 1.0' because of cobbles; however, all analyses were completed.
					Subsurface Soil	0.5-1.0	Metals, Radionuclides, VOCs		
CD43-008	750138.050	2083439.620	750135.338	2083435.738	Surface Soil	0-0.5	Metals, Radionuclides, VOCs	4.7 NE	Statistical sample. Refusal at 0.5' because of cobbles. B interval (0.5-2.5') not sampled.
CD43-009	750153.480	2083502.470	750155.346	2083504.902	Surface Soil	0.7-1.2	Metals, Radionuclides, VOCs	3.1 SW	Statistical sample. Refusal at 1.6' because of cobbles. All analyses were completed. Concrete at 0-0.7'.
					Subsurface Soil	1.2-1.6	Metals, Radionuclides, VOCs		
CD43-010	750047.960	2083496.110	750048.704	2083488.194	Subsurface Soil	16.5-18.5	Metals, Radionuclides, VOCs	8.0 E	Relocated to the outside of Building 561 to target downgradient side of tank.
					Subsurface Soil	18.5-20.5	Metals, Radionuclides, VOCs		
					Subsurface Soil	20.5-22.5	Metals, Radionuclides, VOCs		

Location Code	Actual Northing	Actual Easting	Proposed Northing	Proposed Easting	Actual Media	Actual Depth Interval (ft)	Actual Analytes	Offset Distance (ft) and Direction	Comments
CD43-013	750068.854	2083521.830	750056.048	2083526.551	Subsurface Soil	6.5-8.5	Metals, Radionuclides, VOCs	13.6 NW	Relocated to target Tank 7 from the exterior of Building 528. Collected at the depth that the OPWL entered Building 528.
					Subsurface Soil	8.5-10.2	Metals, Radionuclides, VOCs		
					Subsurface Soil	10.5-12.5	Metals, Radionuclides, VOCs		
					Subsurface Soil	12.5-14.5	Metals, Radionuclides, VOCs		
					Subsurface Soil	14.5-16.5	Metals, Radionuclides, VOCs		
					Subsurface Soil	16.5-18.5	Metals, Radionuclides, VOCs		
					Subsurface Soil	18.5-20.5	Metals, Radionuclides, VOCs		
					Subsurface Soil	20.5-22.5	Metals, Radionuclides, VOCs		
CD43-014	750098.092	2083380.070	750097.743	2083379.861	Surface Soil	0-0.5	Metals, Radionuclides, VOCs	<1	Biased location targeted for south loading dock. No significant change in location.
CD43-015	750137.050	2083467.610	750135.357	2083463.808	Surface Soil	0-0.5	Metals, Radionuclides, VOCs	4.2 NE	Relocated to target east end of tunnel. B interval (0.5'-2.5') not recovered due to cobbles.
CD43-016	750098.926	2083498.975	750102.310	2083505.241	Surface Soil	0-0.5	Metals, Radionuclides, VOCs	7.1 SW	Relocated to target OPWL.
					Subsurface Soil	0.5-2.5	Metals, Radionuclides, VOCs		
					Subsurface Soil	6.5-8.5	Metals, Radionuclides, VOCs		

Draft Closeout Report for IHSS Group 500-3

Location Code	Actual Northing	Actual Easting	Proposed Northing	Proposed Easting	Actual Media	Actual Depth Interval (ft)	Actual Analytes	Offset Distance (ft) and Direction	Comments
CD43-017	750115.480	2083433.140	750114.641	2083432.734	Surface Soil	0-0.5	Metals, Radionuclides, VOCs	<1	Biased for chemical storage closet. No significant change in location. Refusal at 0.8' because of cobbles; however, all analyses were completed.
					Subsurface Soil	0.5-0.8	Metals, Radionuclides, VOCs		
CD43-018	750097.401	2083514.302	750097.416	2083514.261	Subsurface Soil	6.5-8.5	Metals, Radionuclides, VOCs	<1	Biased for 7-ft-deep OPWL. No significant change in location.
CD43-021	750083.639	2083529.285	NA	NA	Subsurface Soil	15.0-16.0	Radionuclides	NA	Northern sidewall of Building 528 excavation. Sampled from excavator bucket.
CD43-022	750034.797	2083549.844	NA	NA	Subsurface Soil	17.0-18.0	Radionuclides	NA	Southern sidewall of Building 528 excavation. Sampled from excavator bucket.
CD43-023	750048.825	2083501.976	NA	NA	Subsurface Soil	17.0-18.0	Radionuclides	NA	Western sidewall of Building 528 excavation. Sampled from excavator bucket.
CD43-024	750059.305	2083539.531	NA	NA	Subsurface Soil	20.0-21.0	Radionuclides	NA	Center of Building 528 excavation. Sampled from excavator bucket.
CD43-025	750036.850	2083505.458	NA	NA	Subsurface Soil	0-0.5	Radionuclides	NA	Soil characterization sample collected from Building 528 excavation waste staging area.
CD43-026	750026.414	2083507.211	NA	NA	Subsurface Soil	0-0.5	Radionuclides	NA	Soil characterization sample collected from Building 528 excavation waste staging area.
CD43-027	750037.133	2083513.661	NA	NA	Subsurface Soil	0-0.5	Radionuclides	NA	Soil characterization sample collected from Building 528 excavation waste staging area.
CD43-028	750025.414	2083513.554	NA	NA	Subsurface Soil	0-0.5	Radionuclides	NA	Soil characterization sample collected from Building 528 excavation waste staging area.

Location Code	Actual Northing	Actual Easting	Proposed Northing	Proposed Easting	Actual Media	Actual Depth Interval (ft)	Actual Analytes	Offset Distance (ft) and Direction	Comments
CD43-029	750060.129	2083480.533	NA	NA	Subsurface Soil	20.0-22.0	Radionuclides	NA	Characterization sample collected beneath Building 561 tank.
CD43-030	750137.676	2083282.648	NA	NA	Subsurface Soil	12.0-12.5	Metals, Radionuclides, VOCs	NA	Western end of UBC 559 tunnel.
CD43-031	750134.355	2083384.698	NA	NA	Subsurface Soil	12.0-12.5	Metals, Radionuclides, VOCs	NA	Midpoint of UBC 559 tunnel.
CD43-032	750134.796	2083458.820	NA	NA	Subsurface Soil	12.0-12.5	Metals, Radionuclides, VOCs	NA	Eastern end of UBC 559 tunnel.
CD43-033	750112.386	2083516.974	NA	NA	Subsurface Soil	5.0-5.5	VOCs	NA	Location sampled because an odor was noticed during excavation.
CD43-034	750198.392	2083468.364	NA	NA	Subsurface Soil	2.0-2.3	Radionuclides	NA	OPWL characterization sample, east-west line, northeastern UBC 559.
CD43-035	750199.742	2083478.123	NA	NA	Subsurface Soil	2.0-2.3	Radionuclides	NA	OPWL characterization sample, east-west line, northeastern UBC 559.
CD43-036	750198.434	2083489.273	NA	NA	Subsurface Soil	3.0-3.3	Radionuclides	NA	OPWL characterization sample, east-west line, northeastern UBC 559.
CD43-037	750088.960	2083519.330	NA	NA	Subsurface Soil	8.0-8.3	Radionuclides	NA	OPWL characterization sample, between Buildings 528 and 559.
CD43-038	750197.160	2083459.436	NA	NA	Subsurface Soil	0.0-4.0	Radionuclides	NA	Confirmation sample, UBC 559, Room 130 hot spot excavation, northern sidewall, composite.
CD43-039	750193.377	2083459.532	NA	NA	Subsurface Soil	4.0-4.3	Radionuclides	NA	Confirmation grab sample, UBC 559, Room 130 hot spot excavation, center of pit.

Draft Closeout Report for IHSS Group 500-3

Location Code	Actual Northing	Actual Easting	Proposed Northing	Proposed Easting	Actual Media	Actual Depth Interval (ft)	Actual Analytes	Offset Distance (ft) and Direction	Comments
CD43-041	750192.254	2083466.888	NA	NA	Subsurface Soil	0.0-4.0	Radionuclides	NA	Confirmation sample, UBC 559, Room 130 hot spot excavation, eastern sidewall, composite.
CD43-042	750190.131	2083451.486	NA	NA	Subsurface Soil	0.0-4.5	Radionuclides	NA	Confirmation sample, UBC 559, Room 130 hot spot excavation, western sidewall, composite.
CD43-044	750182.935	2083455.786	NA	NA	Subsurface Soil	2.5-5.0	Radionuclides	NA	Confirmation sample, UBC 559, Room 130 hot spot excavation, southern sidewall, composite. Concrete at 0-2.5'.
CD43-054	750102.153	2083516.970	NA	NA	Subsurface Soil	7.5-7.8	Radionuclides	NA	OPWL characterization sample beneath manway between Buildings 528 and 559.
CD43-055	750099.934	2083519.552	NA	NA	Subsurface Soil	9.0-9.5	Metals, Radionuclides, VOCs	NA	Confirmation sample for hot spot excavated beneath manway between Buildings 528 and 559.
CD44-000	750188.878	2083530.912	750185.019	2083535.230	Subsurface Soil	6.5-8.5	Metals, Radionuclides, VOCs	5.8 NW	Sample biased for coverage. Relocated to avoid concrete sidewalk.
CD44-001	750172.090	2083532.417	750176.167	2083518.905	Surface Soil	0-0.5	Metals, Radionuclides, VOCs	14.1 SE	Statistical sample relocated to avoid conex box and HVAC equipment.
					Subsurface Soil	0.5-2.5	Metals, Radionuclides, VOCs		
					Subsurface Soil	6.5-8.5	Metals, Radionuclides, VOCs		
CD44-002	750174.950	2083353.140	750172.350	2083361.509	Surface Soil	0-0.5	Metals, Radionuclides, VOCs	8.8 NW	Relocated to target cutting line area. Refusal at 1.0' because of cobbles; however, all analyses were completed.
					Subsurface Soil	0.5-1.0	Metals, Radionuclides, VOCs		

Location Code	Actual Northing	Actual Easting	Proposed Northing	Proposed Easting	Actual Media	Actual Depth Interval (ft)	Actual Analytes	Offset Distance (ft) and Direction	Comments
CD44-003	750187.640	2083380.890	750185.232	2083383.829	Surface Soil	0-0.5	Metals, Radionuclides, VOCs	3.8 NW	Statistical sample relocated to avoid OPWL line. Refusal at 1.0' because of cobbles; however, all analyses were completed.
					Subsurface Soil	0.5-1.0	Metals, Radionuclides, VOCs		
CD44-005	750184.640	2083459.240	750184.794	2083463.207	Surface Soil	0-0.5	Metals, Radionuclides, VOCs	4.0 W	Relocated to target sump. B interval (0.5-2.5') not sampled to avoid spreading contamination detected on field instruments (30,000 cpm - core; 3,000 cpm - soil).
CD44-006	750147.076	2083455.714	NA	NA	Subsurface Soil	4.0-4.3	Radionuclides	NA	OPWL characterization sample.
CD44-007	750156.945	2083470.888	NA	NA	Subsurface Soil	4.0-4.3	Radionuclides	NA	OPWL characterization sample.
CD44-008	750141.180	2083472.109	NA	NA	Subsurface Soil	4.0-4.3	Radionuclides	NA	Characterization sample adjacent to east end of air tunnel.
CD44-009	750125.190	2083465.114	NA	NA	Subsurface Soil	5.0-5.3	Radionuclides	NA	In-process sample collected at hot spot east of air tunnel.
CD44-010	750125.622	2083431.811	NA	NA	Subsurface Soil	5.0-5.3	Radionuclides	NA	Adjacent to south side of air tunnel.
CD44-011	750127.319	2083374.294	NA	NA	Subsurface Soil	5.0-5.3	Radionuclides	NA	Adjacent to south side of air tunnel.
CD44-012	750126.916	2083466.281	NA	NA	Subsurface Soil	9.0-9.3	Radionuclides	NA	In-process sample collected at hot spot south of air tunnel.
CD44-013	750124.718	2083467.964	NA	NA	Subsurface Soil	9.0-9.3	Radionuclides	NA	Confirmation sample, eastern side of hot spot south of air tunnel.
CD44-014	750122.689	2083466.845	NA	NA	Subsurface Soil	9.0-9.3	Radionuclides	NA	Confirmation sample, southern side of hot spot south of air tunnel.
CD44-015	750124.613	2083461.325	NA	NA	Subsurface Soil	9.0-9.3	Radionuclides	NA	In-process sample collected at hot spot south of air tunnel.

Location Code	Actual Northing	Actual Easting	Proposed Northing	Proposed Easting	Actual Media	Actual Depth Interval (ft)	Actual Analytes	Offset Distance (ft) and Direction	Comments
CD44-016	750124.973	2083466.293	NA	NA	Subsurface Soil	9.0-9.3	Radionuclides	NA	Confirmation sample, hot spot east of air tunnel, center of excavation.
CD44-017	750126.729	2083464.618	NA	NA	Subsurface Soil	11.0-11.3	Radionuclides	NA	Confirmation sample, northern side of hot spot east of air tunnel.
CD44-018	750125.263	2083458.306	NA	NA	Subsurface Soil	11.0-11.3	Radionuclides	NA	Confirmation sample, western side of hot spot east of air tunnel.
CD44-019	750167.909	2083435.156	NA	NA	Subsurface Soil	4.0-4.3	Radionuclides	NA	OPWL characterization sample for newly discovered OPWL along the center of the northern side of UBC 559 slab.
CE43-000	750054.497	2083555.328	750051.504	2083563.590	Subsurface Soil	6.5-7.1	Metals, Radionuclides, VOCs	8.8 NW	Relocated to target OPWL and Building 528 basement.
					Subsurface Soil	8.5-10.1	Metals, Radionuclides, VOCs		
					Subsurface Soil	10.5-11.5	Metals, Radionuclides, VOCs		
					Subsurface Soil	12.5-14.0	Metals, Radionuclides, VOCs		
					Subsurface Soil	14.7-15.8	Metals, Radionuclides, VOCs		
					Subsurface Soil	16.5-18.5	Metals, Radionuclides, VOCs		
					Subsurface Soil	18.5-20.5	Metals, Radionuclides, VOCs		
					Subsurface Soil	20.5-22.4	Metals, Radionuclides, VOCs		

Location Code	Actual Northing	Actual Easting	Proposed Northing	Proposed Easting	Actual Media	Actual Depth Interval (ft)	Actual Analytes	Offset Distance (ft) and Direction	Comments
CE43-001	750149.154	2083546.442	750148.636	2083542.100	Surface Soil	0-0.5	Metals, Radionuclides	4.4 E	Statistical sample moved to avoid abandoned communications line (encased in red concrete). VOCs not analyzed in surface soil because asphalt was present.
					Subsurface Soil	0.5-2.5	Metals, Radionuclides, VOCs		
					Subsurface Soil	6.5-8.5	Metals, Radionuclides, VOCs		
CE43-002	750053.000	2083541.000	750053.397	2083540.803	Surface Soil	0-0.5	Metals, Radionuclides, VOCs	<1	Statistical sample. No significant change in location.
					Subsurface Soil	0.5-1.5	Metals, Radionuclides, VOCs		
CE43-003	750068.022	2083534.546	750057.613	2083550.064	Subsurface Soil	19.5-20.5	Metals, PCBs, Pesticides, Herbicides, Radionuclides, VOCs	18.7 NW	Biased for tank and sump. Relocated to avoid OPWL line and building footer.
					Subsurface Soil	21.5-22.5	Metals, PCBs, Pesticides, Herbicides, Radionuclides, VOCs		
CE43-020	750089.814	2083577.667	NA	NA	Subsurface Soil	17.0-18.0	Radionuclides	NA	Eastern sidewall of Building 528 excavation. Sampled from excavator bucket.
CE43-021	750075.377	2083513.984	NA	NA	Subsurface Soil	12.0-13.0	Radionuclides	NA	OPWL characterization sample associated with an OPWL line that broke during excavation at Building 528.
CE43-022	750075.377	2083513.984	NA	NA	Subsurface Soil	8.0-9.0	Radionuclides	NA	OPWL characterization sample associated with an OPWL line that broke during excavation at Building 528.

In addition to being more economical than collecting samples by coring through the slab, sampling based on visual inspection of the lines as they were being removed allowed samples to be targeted more closely to specific areas of concern. In addition to any lines that may have been broken historically, some lines were broken during removal. Although no waste was observed escaping from any of the lines that broke as they were removed, samples were collected in areas where lines broke during removal.

As shown in Table 1, three fewer surface soil samples were collected than were specified in IASAP Addendum #IA-03-12 (DOE 2003a). This occurred because three sampling locations that were originally planned to be sampled by coring through the floor of the Building 528 Pit were instead moved to locations immediately outside the building, and the samples were collected by drilling from the ground surface. Based on engineering drawings, the bottom of the sump within the 528 Pit was 20.8 ft deep. Therefore, the initial depth interval sampled through the floor of the sump would be equivalent to 20.8 ft deep if sampled from the ground surface outside of Building 528. The Building 528 sampling was specifically targeted to sump depth, thus the three locations moved to the outside of the building changed from surface soil to subsurface soil.

Analytical suites were generally consistent with those specified in IASAP Addendum #IA-03-12 (DOE 2003a). The OPWL characterization samples collected during OPWL removal were all subsurface soil samples and were typically analyzed for radionuclides by gamma spectroscopy. Some were also analyzed for metals and volatile organic compounds (VOCs). Confirmation samples associated with the removal of radionuclide-contaminated soil were analyzed for radionuclides by both alpha spectroscopy and gamma spectroscopy.

IHSS Group 500-3 accelerated action soil results greater than RLs (for organic analytes) or background means plus two standard deviations (for inorganic analytes) are presented in Table 3. WRW AL exceedances are displayed in bold in Table 3. Plutonium-239/240 and uranium-234 activities inferred from high-purity germanium (HPGe) gamma spectroscopy results for americium-241 and uranium-238 are italicized in Table 3. Figures 3, 4, and 5 present surface and subsurface soil data for characterization samples, with WRW AL exceedances shown in red. Confirmation sample data are presented in Section 4.0.

The summary statistics for IHSS Group 500-3 surface and subsurface soil samples are presented in Tables 4 and 5, respectively. Both characterization and confirmation samples are included. For inorganics, only those detections greater than the background means plus two standard deviations are included in the detection frequency and average calculations.

As Figures 3, 4, and 5 indicate, three hot spots were identified as a result of soil sampling in IHSS Group 500-3. The surface soil sample collected at CD44-005 had a plutonium-239/240 activity of 8,130 pCi/g and an americium-241 activity of 1,200 pCi/g. A second hot spot was identified immediately south of the eastern end of the Building 559 air tunnel. Three characterization samples collected at depths ranging from 5.0 to 9.3 ft below ground surface (bgs) had plutonium activities ranging from 61 to 158 pCi/g. The third hot spot was detected after a manway vault between Buildings 528 and 559 was removed. A soil sample collected beneath the manway at a depth of 7.5 to 7.8 ft bgs had a plutonium-239/240 activity of 1,810 pCi/g and an americium-241 activity of 318 pCi/g.

28/

Table 3
IHSS Group 500-3 Results Greater Than RLs or Background Means Plus Two Standard Deviations

Location Code	Northing	Easting	Sample Starting Depth (ft bgs)	Sample Ending Depth (ft bgs)	Analyte	Result	RL	WRW AL	Background Mean Plus Two Standard Deviations	Unit
CA42-036	750199.340	2083458.966	0.0	4.0	Americium-241	5.07	NA	76	0.023	pCi/g
CA42-036	750199.340	2083458.966	0.0	4.0	Plutonium-239/240	25.3	NA	50	0.066	pCi/g
CA42-039	750190.136	2083465.145	0.0	4.0	Americium-241	6.21	NA	76	0.023	pCi/g
CA42-039	750190.136	2083465.145	0.0	4.0	Plutonium-239/240	45.2	NA	50	0.066	pCi/g
CC43-000	750139.060	2083312.670	0.0	0.4	Barium	717	NA	26400	141.260	mg/kg
CC43-000	750139.060	2083312.670	0.0	0.4	Chromium	32.4	NA	268	16.990	mg/kg
CC43-000	750139.060	2083312.670	0.0	0.4	Cobalt	12	NA	1550	10.910	mg/kg
CC43-000	750139.060	2083312.670	0.0	0.4	Copper	155	NA	40900	18.060	mg/kg
CC43-000	750139.060	2083312.670	0.0	0.4	Iron	35700	NA	307000	18037.000	mg/kg
CC43-000	750139.060	2083312.670	0.0	0.4	Manganese	627	NA	3480	365.080	mg/kg
CC43-000	750139.060	2083312.670	0.0	0.4	Nickel	46.1	NA	20400	14.910	mg/kg
CC43-000	750139.060	2083312.670	0.0	0.4	Strontium	246	NA	613000	48.940	mg/kg
CC43-000	750139.060	2083312.670	0.0	0.4	Tin	30.4	NA	613000	2.900	mg/kg
CC43-000	750139.060	2083312.670	0.0	0.4	Vanadium	58.6	NA	7150	45.590	mg/kg
CC43-000	750139.060	2083312.670	0.0	0.4	Zinc	74.7	NA	307000	73.760	mg/kg
CC43-001	750118.480	2083285.890	0.0	0.5	Aluminum	20000	NA	228000	16902.000	mg/kg
CC43-001	750118.480	2083285.890	0.0	0.5	Beryllium	1.1	NA	921	0.966	mg/kg
CC43-001	750118.480	2083285.890	0.0	0.5	Chromium	17	NA	268	16.990	mg/kg
CC43-001	750118.480	2083285.890	0.0	0.5	Copper	19	NA	40900	18.060	mg/kg
CC43-001	750118.480	2083285.890	0.0	0.5	Naphthalene	6.88	5.62	3090000	NA	µg/kg
CC43-001	750118.480	2083285.890	0.0	0.5	Nickel	16	NA	20400	14.910	mg/kg
CC43-001	750118.480	2083285.890	0.0	0.5	Xylene	15.5	11.2	2040000	NA	µg/kg
CC43-001	750118.480	2083285.890	0.5	1.0	Uranium-235	0.125	NA	8	0.120	pCi/g
CC43-001	750118.480	2083285.890	0.5	1.0	Xylene	19.8	12.1	2040000	NA	µg/kg
CC43-030	750098.180	2083515.490	4.5	6.0	Americium-241	0.919	NA	76	0.020	pCi/g
CC43-030	750098.180	2083515.490	4.5	6.0	Plutonium-239/240	5.236	NA	50	0.020	pCi/g

Location Code	Northing	Easting	Sample Starting Depth (ft bgs)	Sample Ending Depth (ft bgs)	Analyte	Result	RL	WRW AL	Background Mean Plus Two Standard Deviations	Unit
CC43-030	750098.180	2083515.490	6.5	7.5	Uranium-235	0.159	NA	8	0.120	pCi/g
CC44-000	750186.640	2083317.370	0.0	0.5	Uranium-234	2.405	NA	300	2.253	pCi/g
CC44-000	750186.640	2083317.370	0.0	0.5	Uranium-235	0.264	NA	8	0.094	pCi/g
CC44-000	750186.640	2083317.370	0.0	0.5	Uranium-238	2.405	NA	351	2.000	pCi/g
CC44-000	750186.640	2083317.370	0.5	0.9	Uranium-234	2.918	NA	300	2.640	pCi/g
CC44-000	750186.640	2083317.370	0.5	0.9	Uranium-235	0.184	NA	8	0.120	pCi/g
CC44-000	750186.640	2083317.370	0.5	0.9	Uranium-238	2.918	NA	351	1.490	pCi/g
CC44-001	750167.950	2083314.200	0.0	0.5	Uranium-234	2.388	NA	300	2.253	pCi/g
CC44-001	750167.950	2083314.200	0.0	0.5	Uranium-235	0.182	NA	8	0.094	pCi/g
CC44-001	750167.950	2083314.200	0.0	0.5	Uranium-238	2.388	NA	351	2.000	pCi/g
CC44-001	750167.950	2083314.200	0.0	0.5	Xylene	21.8	10.5	2040000	NA	µg/kg
CC44-001	750167.950	2083314.200	0.5	1.0	Uranium-234	4.51	NA	300	2.640	pCi/g
CC44-001	750167.950	2083314.200	0.5	1.0	Uranium-235	0.173	NA	8	0.120	pCi/g
CC44-001	750167.950	2083314.200	0.5	1.0	Uranium-238	4.51	NA	351	1.490	pCi/g
CC44-001	750167.950	2083314.200	0.5	1.0	Xylene	9.72	9.46	2040000	NA	µg/kg
CC44-002	750234.370	2083331.520	0.0	0.5	Antimony	0.48	NA	409	0.470	mg/kg
CC44-002	750234.370	2083331.520	0.0	0.5	Chromium	17	NA	268	16.990	mg/kg
CC44-002	750234.370	2083331.520	0.0	0.5	Cobalt	24	NA	1550	10.910	mg/kg
CC44-002	750234.370	2083331.520	0.0	0.5	Copper	65	NA	40900	18.060	mg/kg
CC44-002	750234.370	2083331.520	0.0	0.5	Nickel	19	NA	20400	14.910	mg/kg
CC44-002	750234.370	2083331.520	0.0	0.5	Tin	6.6	NA	613000	2.900	mg/kg
CC44-002	750234.370	2083331.520	0.0	0.5	Uranium-234	4.687	NA	300	2.253	pCi/g
CC44-002	750234.370	2083331.520	0.0	0.5	Uranium-235	0.188	NA	8	0.094	pCi/g
CC44-002	750234.370	2083331.520	0.0	0.5	Uranium-238	4.687	NA	351	2.000	pCi/g
CC44-002	750234.370	2083331.520	0.5	0.9	Uranium-234	4.375	NA	300	2.640	pCi/g
CC44-002	750234.370	2083331.520	0.5	0.9	Uranium-235	0.296	NA	8	0.120	pCi/g
CC44-002	750234.370	2083331.520	0.5	0.9	Uranium-238	4.375	NA	351	1.490	pCi/g
CC44-003	750173.210	2083266.818	0.0	0.5	Aluminum	18000	NA	228000	16902.000	mg/kg
CC44-003	750173.210	2083266.818	0.0	0.5	Beryllium	1.2	NA	921	0.966	mg/kg

Draft Closeout Report for IHSS Group 500-3

Location Code	Northing	Easting	Sample Starting Depth (ft bgs)	Sample Ending Depth (ft bgs)	Analyte	Result	RL	WRW AL	Background Mean Plus Two Standard Deviations	Unit
CC44-003	750173.210	2083266.818	0.0	0.5	Chromium	20	NA	268	16.990	mg/kg
CC44-003	750173.210	2083266.818	0.0	0.5	Cobalt	22	NA	1550	10.910	mg/kg
CC44-003	750173.210	2083266.818	0.0	0.5	Copper	53	NA	40900	18.060	mg/kg
CC44-003	750173.210	2083266.818	0.0	0.5	Nickel	23	NA	20400	14.910	mg/kg
CC44-003	750173.210	2083266.818	0.0	0.5	Strontium	56	NA	613000	48.940	mg/kg
CC44-003	750173.210	2083266.818	0.0	0.5	Uranium-234	4.687	NA	300	2.253	pCi/g
CC44-003	750173.210	2083266.818	0.0	0.5	Uranium-235	0.225	NA	8	0.094	pCi/g
CC44-003	750173.210	2083266.818	0.0	0.5	Uranium-238	4.687	NA	351	2.000	pCi/g
CC44-003	750173.210	2083266.818	0.0	0.5	Zinc	130	NA	307000	73.760	mg/kg
CD43-001-01	750075.979	2083537.001	6.5	8.5	Uranium-235	0.121	NA	8	0.120	pCi/g
CD43-002-01	750080.988	2083519.093	0.5	2.5	Toluene	12.7	5.02	31300000	NA	µg/kg
CD43-002-01	750080.988	2083519.093	0.5	2.5	Uranium-234	4.319	NA	300	2.640	pCi/g
CD43-002-01	750080.988	2083519.093	0.5	2.5	Uranium-235	0.242	NA	8	0.120	pCi/g
CD43-002-01	750080.988	2083519.093	0.5	2.5	Uranium-238	4.319	NA	351	1.490	pCi/g
CD43-002-01	750080.988	2083519.093	0.5	2.5	Xylene	82.2	10	2040000	NA	µg/kg
CD43-002-01	750080.988	2083519.093	6.5	8.5	Ethylbenzene	18.8	5.66	4250000	NA	µg/kg
CD43-002-01	750080.988	2083519.093	6.5	8.5	Toluene	27.4	5.66	31300000	NA	µg/kg
CD43-002-01	750080.988	2083519.093	6.5	8.5	Uranium-235	0.162	NA	8	0.120	pCi/g
CD43-002-01	750080.988	2083519.093	6.5	8.5	Xylene	116	11.3	2040000	NA	µg/kg
CD43-003	750115.019	2083530.017	0.5	2.5	Lead	27	NA	1000	24.970	mg/kg
CD43-003	750115.019	2083530.017	0.5	2.5	Uranium-235	0.142	NA	8	0.120	pCi/g
CD43-003	750115.019	2083530.017	0.5	2.5	Xylene	23.2	10.3	2040000	NA	µg/kg
CD43-003	750115.019	2083530.017	6.5	8.5	Arsenic	15	NA	22.2	13.140	mg/kg
CD43-004	750139.060	2083361.670	0.0	0.5	Arsenic	17.7	NA	22.2	10.090	mg/kg
CD43-004	750139.060	2083361.670	0.0	0.5	Barium	801	NA	26400	141.260	mg/kg
CD43-004	750139.060	2083361.670	0.0	0.5	Chromium	54.9	NA	268	16.990	mg/kg
CD43-004	750139.060	2083361.670	0.0	0.5	Cobalt	12.7	NA	1550	10.910	mg/kg
CD43-004	750139.060	2083361.670	0.0	0.5	Iron	41600	NA	307000	18037.000	mg/kg
CD43-004	750139.060	2083361.670	0.0	0.5	Manganese	670	NA	3480	365.080	mg/kg

Draft Closeout Report for IHSS Group 500-3

Location Code	Northing	Easting	Sample Starting Depth (ft bgs)	Sample Ending Depth (ft bgs)	Analyte	Result	RL	WRW AL	Background Mean Plus Two Standard Deviations	Unit
CD43-004	750139.060	2083361.670	0.0	0.5	Nickel	59.8	NA	20400	14.910	mg/kg
CD43-004	750139.060	2083361.670	0.0	0.5	Strontium	216	NA	613000	48.940	mg/kg
CD43-004	750139.060	2083361.670	0.0	0.5	Uranium-235	0.194	NA	8	0.094	pCi/g
CD43-004	750139.060	2083361.670	0.0	0.5	Vanadium	111	NA	7150	45.590	mg/kg
CD43-004	750139.060	2083361.670	0.0	0.5	Zinc	86.1	NA	307000	73.760	mg/kg
CD43-005	750103.940	2083461.890	0.0	0.5	Uranium-234	5.139	NA	300	2.253	pCi/g
CD43-005	750103.940	2083461.890	0.0	0.5	Uranium-235	0.245	NA	8	0.094	pCi/g
CD43-005	750103.940	2083461.890	0.0	0.5	Uranium-238	5.139	NA	351	2.000	pCi/g
CD43-006	750159.960	2083449.840	0.0	0.5	Uranium-235	0.127	NA	8	0.094	pCi/g
CD43-007	750116.480	2083377.120	0.0	0.5	Cobalt	17	NA	1550	10.910	mg/kg
CD43-007	750116.480	2083377.120	0.0	0.5	Copper	39	NA	40900	18.060	mg/kg
CD43-007	750116.480	2083377.120	0.0	0.5	Uranium-235	0.16	NA	8	0.094	pCi/g
CD43-007	750116.480	2083377.120	0.5	1.0	Uranium-234	3.724	NA	300	2.640	pCi/g
CD43-007	750116.480	2083377.120	0.5	1.0	Uranium-235	0.131	NA	8	0.120	pCi/g
CD43-007	750116.480	2083377.120	0.5	1.0	Uranium-238	3.724	NA	351	1.490	pCi/g
CD43-008	750138.050	2083439.620	0.0	0.5	Arsenic	19.7	NA	22.2	10.090	mg/kg
CD43-008	750138.050	2083439.620	0.0	0.5	Barium	909	NA	26400	141.260	mg/kg
CD43-008	750138.050	2083439.620	0.0	0.5	Chromium	44.2	NA	268	16.990	mg/kg
CD43-008	750138.050	2083439.620	0.0	0.5	Cobalt	13.4	NA	1550	10.910	mg/kg
CD43-008	750138.050	2083439.620	0.0	0.5	Iron	37300	NA	307000	18037.000	mg/kg
CD43-008	750138.050	2083439.620	0.0	0.5	Manganese	1280	NA	3480	365.080	mg/kg
CD43-008	750138.050	2083439.620	0.0	0.5	Nickel	49.7	NA	20400	14.910	mg/kg
CD43-008	750138.050	2083439.620	0.0	0.5	Strontium	222	NA	613000	48.940	mg/kg
CD43-008	750138.050	2083439.620	0.0	0.5	Tin	20.9	NA	613000	2.900	mg/kg
CD43-008	750138.050	2083439.620	0.0	0.5	Uranium-235	0.192	NA	8	0.094	pCi/g
CD43-008	750138.050	2083439.620	0.0	0.5	Uranium-238	2.105	NA	351	2.000	pCi/g
CD43-008	750138.050	2083439.620	0.0	0.5	Vanadium	90.3	NA	7150	45.590	mg/kg
CD43-008	750138.050	2083439.620	0.0	0.5	Zinc	122	NA	307000	73.760	mg/kg
CD43-009	750153.480	2083502.470	1.2	1.6	Trichloroethene	2.3	0.92	19600	NA	µg/kg

Draft Closeout Report for IHSS Group 500-3

Location Code	Northing	Easting	Sample Starting Depth (ft bgs)	Sample Ending Depth (ft bgs)	Analyte	Result	RL	WRW AL	Background Mean Plus Two Standard Deviations	Unit
CD43-009	750153.480	2083502.470	1.2	1.6	Uranium-235	0.134	NA	8	0.120	pCi/g
CD43-010	750047.960	2083496.110	16.5	18.5	Trichloroethene	29.9	6.22	19600	NA	µg/kg
CD43-010	750047.960	2083496.110	16.5	18.5	Uranium-235	0.165	NA	8	0.120	pCi/g
CD43-010	750047.960	2083496.110	16.5	18.5	Uranium-238	2.008	NA	351	1.490	pCi/g
CD43-010	750047.960	2083496.110	18.5	20.5	Trichloroethene	21	5.46	19600	NA	µg/kg
CD43-010	750047.960	2083496.110	20.5	22.5	Trichloroethene	11.7	5.7	19600	NA	µg/kg
CD43-010	750047.960	2083496.110	20.5	22.5	Uranium-235	0.124	NA	8	0.120	pCi/g
CD43-013	750068.854	2083521.830	6.5	8.5	Americium-241	2.224	NA	76	0.020	pCi/g
CD43-013	750068.854	2083521.830	6.5	8.5	Plutonium-239/240	12.677	NA	50	0.020	pCi/g
CD43-013	750068.854	2083521.830	6.5	8.5	Uranium-238	1.626	NA	351	1.490	pCi/g
CD43-013	750068.854	2083521.830	8.5	10.2	Americium-241	0.5132	NA	76	0.020	pCi/g
CD43-013	750068.854	2083521.830	8.5	10.2	Plutonium-239/240	2.925	NA	50	0.020	pCi/g
CD43-013	750068.854	2083521.830	10.5	12.5	Americium-241	1.05	NA	76	0.020	pCi/g
CD43-013	750068.854	2083521.830	10.5	12.5	Plutonium-239/240	5.985	NA	50	0.020	pCi/g
CD43-013	750068.854	2083521.830	10.5	12.5	Uranium-235	0.224	NA	8	0.120	pCi/g
CD43-013	750068.854	2083521.830	10.5	12.5	Uranium-238	1.554	NA	351	1.490	pCi/g
CD43-013	750068.854	2083521.830	12.5	14.5	Uranium-235	0.139	NA	8	0.120	pCi/g
CD43-013	750068.854	2083521.830	14.5	16.5	Americium-241	0.609	NA	76	0.020	pCi/g
CD43-013	750068.854	2083521.830	14.5	16.5	Plutonium-239/240	3.470	NA	50	0.020	pCi/g
CD43-013	750068.854	2083521.830	16.5	18.5	Arsenic	15	NA	22.2	13.140	mg/kg
CD43-013	750068.854	2083521.830	16.5	18.5	Uranium-234	3.284	NA	300	2.640	pCi/g
CD43-013	750068.854	2083521.830	16.5	18.5	Uranium-235	0.180	NA	8	0.120	pCi/g
CD43-013	750068.854	2083521.830	16.5	18.5	Uranium-238	3.284	NA	351	1.490	pCi/g
CD43-013	750068.854	2083521.830	18.5	20.5	Uranium-234	4.637	NA	300	2.640	pCi/g
CD43-013	750068.854	2083521.830	18.5	20.5	Uranium-235	0.210	NA	8	0.120	pCi/g
CD43-013	750068.854	2083521.830	18.5	20.5	Uranium-238	4.637	NA	351	1.490	pCi/g
CD43-013	750068.854	2083521.830	20.5	22.5	Uranium-234	3.439	NA	300	2.640	pCi/g
CD43-013	750068.854	2083521.830	20.5	22.5	Uranium-235	0.167	NA	8	0.120	pCi/g
CD43-013	750068.854	2083521.830	20.5	22.5	Uranium-238	3.439	NA	351	1.490	pCi/g

Draft Closeout Report for IHSS Group 500-3

Location Code	Northing	Easting	Sample Starting Depth (ft bgs)	Sample Ending Depth (ft bgs)	Analyte	Result	RL	WRW AL	Background Mean Plus Two Standard Deviations	Unit
CD43-014	750098.092	2083380.070	0.0	0.5	Copper	28	NA	40900	18.060	mg/kg
CD43-014	750098.092	2083380.070	0.0	0.5	Uranium-234	4.668	NA	300	2.253	pCi/g
CD43-014	750098.092	2083380.070	0.0	0.5	Uranium-235	0.171	NA	8	0.094	pCi/g
CD43-014	750098.092	2083380.070	0.0	0.5	Uranium-238	4.668	NA	351	2.000	pCi/g
CD43-015	750137.050	2083467.610	0.0	0.5	Acetone	17	5.8	102000000	NA	µg/kg
CD43-015	750137.050	2083467.610	0.0	0.5	Antimony	0.53	NA	409	0.470	mg/kg
CD43-015	750137.050	2083467.610	0.0	0.5	Cobalt	26	NA	1550	10.910	mg/kg
CD43-015	750137.050	2083467.610	0.0	0.5	Copper	67	NA	40900	18.060	mg/kg
CD43-015	750137.050	2083467.610	0.0	0.5	Methylene chloride	2.6	1	2530000	NA	µg/kg
CD43-015	750137.050	2083467.610	0.0	0.5	Plutonium-239/240	0.138	NA	50	0.066	pCi/g
CD43-015	750137.050	2083467.610	0.0	0.5	Strontium	60	NA	613000	48.940	mg/kg
CD43-015	750137.050	2083467.610	0.0	0.5	Tin	6.8	NA	613000	2.900	mg/kg
CD43-016	750098.926	2083498.975	0.0	0.5	Uranium-234	3.84	NA	300	2.253	pCi/g
CD43-016	750098.926	2083498.975	0.0	0.5	Uranium-235	0.245	NA	8	0.094	pCi/g
CD43-016	750098.926	2083498.975	0.0	0.5	Uranium-238	3.84	NA	351	2.000	pCi/g
CD43-016	750098.926	2083498.975	0.5	2.5	Uranium-234	4.627	NA	300	2.640	pCi/g
CD43-016	750098.926	2083498.975	0.5	2.5	Uranium-235	0.217	NA	8	0.120	pCi/g
CD43-016	750098.926	2083498.975	0.5	2.5	Uranium-238	4.627	NA	351	1.490	pCi/g
CD43-016	750098.926	2083498.975	6.5	8.5	Uranium-235	0.183	NA	8	0.120	pCi/g
CD43-017	750115.480	2083433.140	0.0	0.5	Aluminum	22000	NA	228000	16902.000	mg/kg
CD43-017	750115.480	2083433.140	0.0	0.5	Antimony	0.58	NA	409	0.470	mg/kg
CD43-017	750115.480	2083433.140	0.0	0.5	Beryllium	1.3	NA	921	0.966	mg/kg
CD43-017	750115.480	2083433.140	0.0	0.5	Chromium	26	NA	268	16.990	mg/kg
CD43-017	750115.480	2083433.140	0.0	0.5	Cobalt	11	NA	1550	10.910	mg/kg
CD43-017	750115.480	2083433.140	0.0	0.5	Iron	19000	NA	307000	18037.000	mg/kg
CD43-017	750115.480	2083433.140	0.0	0.5	Lithium	13	NA	20400	11.550	mg/kg
CD43-017	750115.480	2083433.140	0.0	0.5	Manganese	430	NA	3480	365.080	mg/kg
CD43-017	750115.480	2083433.140	0.0	0.5	Nickel	25	NA	20400	14.910	mg/kg
CD43-017	750115.480	2083433.140	0.0	0.5	Uranium-234	3.333	NA	300	2.253	pCi/g

Location Code	Northing	Easting	Sample Starting Depth (ft bgs)	Sample Ending Depth (ft bgs)	Analyte	Result	RL	WRW AL	Background Mean Plus Two Standard Deviations	Unit
CD43-017	750115.480	2083433.140	0.0	0.5	Uranium-235	0.191	NA	8	0.094	pCi/g
CD43-017	750115.480	2083433.140	0.0	0.5	Uranium-238	3.333	NA	351	2.000	pCi/g
CD43-017	750115.480	2083433.140	0.0	0.5	Xylene	39.9	10.4	2040000	NA	µg/kg
CD43-017	750115.480	2083433.140	0.5	0.8	4-Methyl-2-pentanone	62.6	55.9	16400000	NA	µg/kg
CD43-017	750115.480	2083433.140	0.5	0.8	Uranium-238	1.634	NA	351	1.490	pCi/g
CD43-017	750115.480	2083433.140	0.5	0.8	Xylene	41.5	11.1	2040000	NA	µg/kg
CD43-018	750097.401	2083514.302	6.5	8.5	Chromium	140	NA	268	68.270	mg/kg
CD43-021	750083.639	2083529.285	15.0	16.0	Uranium-235	0.149	NA	8	0.120	pCi/g
CD43-022	750034.797	2083549.844	17.0	18.0	Americium-241	1.363	NA	76	0.020	pCi/g
CD43-022	750034.797	2083549.844	17.0	18.0	Plutonium-239/240	7.769	NA	50	0.020	pCi/g
CD43-022	750034.797	2083549.844	17.0	18.0	Uranium-235	0.173	NA	8	0.120	pCi/g
CD43-023	750048.825	2083501.976	17.0	18.0	Uranium-235	0.131	NA	8	0.120	pCi/g
CD43-024	750059.305	2083539.531	20.0	21.0	Americium-241	1.002	NA	76	0.020	pCi/g
CD43-024	750059.305	2083539.531	20.0	21.0	Plutonium-239/240	5.711	NA	50	0.020	pCi/g
CD43-024	750059.305	2083539.531	20.0	21.0	Uranium-238	1.675	NA	351	1.490	pCi/g
CD43-025	750036.850	2083505.458	0.0	0.5	Americium-241	0.184	NA	76	0.020	pCi/g
CD43-025	750036.850	2083505.458	0.0	0.5	Plutonium-239/240	1.13	NA	50	0.020	pCi/g
CD43-026	750026.414	2083507.211	0.0	0.5	Uranium-234	4.388	NA	300	2.640	pCi/g
CD43-026	750026.414	2083507.211	0.0	0.5	Uranium-235	0.129	NA	8	0.120	pCi/g
CD43-026	750026.414	2083507.211	0.0	0.5	Uranium-238	4.388	NA	351	1.490	pCi/g
CD43-027	750037.133	2083513.661	0.0	0.5	Uranium-234	4.328	NA	300	2.640	pCi/g
CD43-027	750037.133	2083513.661	0.0	0.5	Uranium-235	0.269	NA	8	0.120	pCi/g
CD43-027	750037.133	2083513.661	0.0	0.5	Uranium-238	4.328	NA	351	1.490	pCi/g
CD43-028	750025.414	2083513.554	0.0	0.5	Uranium-234	2.749	NA	300	2.640	pCi/g
CD43-028	750025.414	2083513.554	0.0	0.5	Uranium-235	0.202	NA	8	0.120	pCi/g
CD43-028	750025.414	2083513.554	0.0	0.5	Uranium-238	2.749	NA	351	1.490	pCi/g
CD43-029	750060.129	2083480.533	20.0	22.0	Uranium-238	1.624	NA	351	1.490	pCi/g
CD43-030	750137.676	2083282.648	12.0	12.5	Barium	699	NA	26400	289.380	mg/kg
CD43-031	750134.355	2083384.698	12.0	12.5	Barium	739	NA	26400	289.380	mg/kg

36/

Draft Closeout Report for IHSS Group 500-3

Location Code	Northing	Easting	Sample Starting Depth (ft bgs)	Sample Ending Depth (ft bgs)	Analyte	Result	RL	WRW AL	Background Mean Plus Two Standard Deviations	Unit
CD43-031	750134.355	2083384.698	12.0	12.5	Iron	42700	NA	307000	41046.520	mg/kg
CD43-031	750134.355	2083384.698	12.0	12.5	Uranium-235	0.186	NA	8	0.120	pCi/g
CD43-032	750134.796	2083458.820	12.0	12.5	Arsenic	16.5	NA	22.2	13.140	mg/kg
CD43-032	750134.796	2083458.820	12.0	12.5	Barium	751	NA	26400	289.380	mg/kg
CD43-032	750134.796	2083458.820	12.0	12.5	Iron	48200	NA	307000	41046.520	mg/kg
CD43-032	750134.796	2083458.820	12.0	12.5	Vanadium	99.5	NA	7150	88.490	mg/kg
CD43-035	750199.742	2083478.123	2.0	2.3	Uranium-235	0.125	NA	8	0.120	pCi/g
CD43-036	750198.434	2083489.273	3.0	3.3	Americium-241	1.159	NA	76	0.020	pCi/g
CD43-036	750198.434	2083489.273	3.0	3.3	Plutonium-239/240	6.606	NA	50	0.020	pCi/g
CD43-036	750198.434	2083489.273	3.0	3.3	Uranium-235	0.143	NA	8	0.120	pCi/g
CD43-037	750088.960	2083519.330	8.0	8.3	Americium-241	1.51	NA	76	0.020	pCi/g
CD43-037	750088.960	2083519.330	8.0	8.3	Plutonium-239/240	8.607	NA	50	0.020	pCi/g
CD43-038	750197.160	2083459.436	0.0	4.0	Americium-241	0.218	NA	76	0.020	pCi/g
CD43-038	750197.160	2083459.436	0.0	4.0	Plutonium-239/240	1.26	NA	50	0.020	pCi/g
CD43-039	750193.377	2083459.532	4.0	4.3	Americium-241	2.32	NA	76	0.020	pCi/g
CD43-039	750193.377	2083459.532	4.0	4.3	Plutonium-239/240	12	NA	50	0.020	pCi/g
CD43-041	750192.254	2083466.888	0.0	4.0	Americium-241	0.306	NA	76	0.020	pCi/g
CD43-041	750192.254	2083466.888	0.0	4.0	Plutonium-239/240	2.57	NA	50	0.020	pCi/g
CD43-042	750190.131	2083451.486	0.0	4.5	Americium-241	2.97	NA	76	0.020	pCi/g
CD43-042	750190.131	2083451.486	0.0	4.5	Plutonium-239/240	17.6	NA	50	0.020	pCi/g
CD43-044	750182.935	2083455.786	2.5	5.0	Americium-241	1.59	NA	76	0.020	pCi/g
CD43-044	750182.935	2083455.786	2.5	5.0	Plutonium-239/240	10.3	NA	50	0.020	pCi/g
CD43-054	750102.153	2083516.970	7.5	7.8	Americium-241	317.5	NA	76	0.020	pCi/g
CD43-054	750102.153	2083516.970	7.5	7.8	Plutonium-239/240	1809.75	NA	50	0.020	pCi/g
CD43-055	750099.934	2083519.552	9.0	9.5	2-Butanone	1.9	1.8	192000000	NA	µg/kg
CD43-055	750099.934	2083519.552	9.0	9.5	Acetone	11	1.6	102000000	NA	µg/kg
CD43-055	750099.934	2083519.552	9.0	9.5	Americium-241	1.64	NA	76	0.020	pCi/g
CD43-055	750099.934	2083519.552	9.0	9.5	Ethylbenzene	0.31	0.1	4250000	NA	µg/kg
CD43-055	750099.934	2083519.552	9.0	9.5	Methylene chloride	2.4	0.36	2530000	NA	µg/kg

Draft Closeout Report for IHSS Group 500-3

Location Code	Northing	Easting	Sample Starting Depth (ft bgs)	Sample Ending Depth (ft bgs)	Analyte	Result	RL	WRW AL	Background Mean Plus Two Standard Deviations	Unit
CD43-055	750099.934	2083519.552	9.0	9.5	Plutonium-239/240	12	NA	50	0.020	pCi/g
CD43-055	750099.934	2083519.552	9.0	9.5	Styrene	0.099	0.081	123000000	NA	µg/kg
CD43-055	750099.934	2083519.552	9.0	9.5	Xylene	1.4	0.035	2040000	NA	µg/kg
CD44-001	750172.090	2083532.417	0.0	0.5	Aluminum	17000	NA	228000	16902.000	mg/kg
CD44-001	750172.090	2083532.417	0.0	0.5	Uranium-234	3.975	NA	300	2.253	pCi/g
CD44-001	750172.090	2083532.417	0.0	0.5	Uranium-235	0.242	NA	8	0.094	pCi/g
CD44-001	750172.090	2083532.417	0.0	0.5	Uranium-238	3.975	NA	351	2.000	pCi/g
CD44-001	750172.090	2083532.417	0.5	2.5	Uranium-234	4.602	NA	300	2.640	pCi/g
CD44-001	750172.090	2083532.417	0.5	2.5	Uranium-235	0.209	NA	8	0.120	pCi/g
CD44-001	750172.090	2083532.417	0.5	2.5	Uranium-238	4.602	NA	351	1.490	pCi/g
CD44-002	750174.950	2083353.140	0.0	0.5	Uranium-234	3.552	NA	300	2.253	pCi/g
CD44-002	750174.950	2083353.140	0.0	0.5	Uranium-235	0.191	NA	8	0.094	pCi/g
CD44-002	750174.950	2083353.140	0.0	0.5	Uranium-238	3.552	NA	351	2.000	pCi/g
CD44-002	750174.950	2083353.140	0.0	0.5	Xylene	20.6	10.5	2040000	NA	µg/kg
CD44-002	750174.950	2083353.140	0.5	1.0	Ethylbenzene	8.91	5.49	4250000	NA	µg/kg
CD44-002	750174.950	2083353.140	0.5	1.0	Xylene	72.9	11	2040000	NA	µg/kg
CD44-003	750187.640	2083380.890	0.0	0.5	Uranium-234	2.946	NA	300	2.253	pCi/g
CD44-003	750187.640	2083380.890	0.0	0.5	Uranium-235	0.249	NA	8	0.094	pCi/g
CD44-003	750187.640	2083380.890	0.0	0.5	Uranium-238	2.946	NA	351	2.000	pCi/g
CD44-003	750187.640	2083380.890	0.5	1.0	Uranium-234	4.635	NA	300	2.640	pCi/g
CD44-003	750187.640	2083380.890	0.5	1.0	Uranium-235	0.165	NA	8	0.120	pCi/g
CD44-003	750187.640	2083380.890	0.5	1.0	Uranium-238	4.635	NA	351	1.490	pCi/g
CD44-005	750184.640	2083459.240	0.0	0.5	1,2,4-Trichlorobenzene	1	0.76	9230000	NA	µg/kg
CD44-005	750184.640	2083459.240	0.0	0.5	4-Methyl-2-pentanone	5.1	4.2	16400000	NA	µg/kg
CD44-005	750184.640	2083459.240	0.0	0.5	Acetone	18	4.9	102000000	NA	µg/kg
CD44-005	750184.640	2083459.240	0.0	0.5	Americium-241	1200	NA	76	0.023	pCi/g
CD44-005	750184.640	2083459.240	0.0	0.5	Copper	28	NA	40900	18.060	mg/kg
CD44-005	750184.640	2083459.240	0.0	0.5	Naphthalene	1.8	0.92	3090000	NA	µg/kg
CD44-005	750184.640	2083459.240	0.0	0.5	Plutonium-239/240	8130	NA	50	0.066	pCi/g

Location Code	Northing	Easting	Sample Starting Depth (ft bgs)	Sample Ending Depth (ft bgs)	Analyte	Result	RL	WRW AL	Background Mean Plus Two Standard Deviations	Unit
CD44-005	750184.640	2083459.240	0.0	0.5	Trichloroethene	2.3	0.93	19600	NA	µg/kg
CD44-005	750184.640	2083459.240	0.0	0.5	Uranium-234	3.11	NA	300	2.253	pCi/g
CD44-005	750184.640	2083459.240	0.0	0.5	Xylene	4.3	3	2040000	NA	µg/kg
CD44-006	750147.076	2083455.714	4.0	4.3	Plutonium-239/240	0.486	NA	50	0.020	pCi/g
CD44-007	750156.945	2083470.888	4.0	4.3	Uranium-235	0.194	NA	8	0.120	pCi/g
CD44-007	750156.945	2083470.888	4.0	4.3	Uranium-238	2.33	NA	351	1.490	pCi/g
CD44-008	750141.180	2083472.109	4.0	4.3	Uranium-234	3.156	NA	300	2.640	pCi/g
CD44-008	750141.180	2083472.109	4.0	4.3	Uranium-235	0.151	NA	8	0.120	pCi/g
CD44-008	750141.180	2083472.109	4.0	4.3	Uranium-238	3.156	NA	351	1.490	pCi/g
CD44-009	750125.190	2083465.114	5.0	5.3	Americium-241	10.62	NA	76	0.020	pCi/g
CD44-009	750125.190	2083465.114	5.0	5.3	Plutonium-239/240	60.534	NA	50	0.020	pCi/g
CD44-009	750125.190	2083465.114	5.0	5.3	Uranium-235	0.192	NA	8	0.120	pCi/g
CD44-009	750125.190	2083465.114	5.0	5.3	Uranium-238	2.236	NA	351	1.490	pCi/g
CD44-010	750125.622	2083431.811	5.0	5.3	Uranium-234	3.27	NA	300	2.640	pCi/g
CD44-010	750125.622	2083431.811	5.0	5.3	Uranium-235	0.162	NA	8	0.120	pCi/g
CD44-010	750125.622	2083431.811	5.0	5.3	Uranium-238	3.27	NA	351	1.490	pCi/g
CD44-011	750127.319	2083374.294	5.0	5.3	Uranium-235	0.141	NA	8	0.120	pCi/g
CD44-012	750126.916	2083466.281	9.0	9.3	Americium-241	13.1	NA	76	0.020	pCi/g
CD44-012	750126.916	2083466.281	9.0	9.3	Plutonium-239/240	74.67	NA	50	0.020	pCi/g
CD44-013	750124.718	2083467.964	9.0	9.3	Americium-241	1.3	NA	76	0.020	pCi/g
CD44-013	750124.718	2083467.964	9.0	9.3	Plutonium-239/240	5.7	NA	50	0.020	pCi/g
CD44-014	750122.689	2083466.845	9.0	9.3	Americium-241	0.122	NA	76	0.020	pCi/g
CD44-014	750122.689	2083466.845	9.0	9.3	Plutonium-239/240	0.21	NA	50	0.020	pCi/g
CD44-015	750124.613	2083461.325	9.0	9.3	Americium-241	27.69	NA	76	0.020	pCi/g
CD44-015	750124.613	2083461.325	9.0	9.3	Plutonium-239/240	157.833	NA	50	0.020	pCi/g
CD44-015	750124.613	2083461.325	9.0	9.3	Uranium-234	4.631	NA	300	2.640	pCi/g
CD44-015	750124.613	2083461.325	9.0	9.3	Uranium-238	4.631	NA	351	1.490	pCi/g
CD44-016	750124.973	2083466.293	9.0	9.3	Americium-241	3.06	NA	76	0.020	pCi/g
CD44-016	750124.973	2083466.293	9.0	9.3	Plutonium-239/240	18.5	NA	50	0.020	pCi/g

Location Code	Northing	Easting	Sample Starting Depth (ft bgs)	Sample Ending Depth (ft bgs)	Analyte	Result	RL	WRW AL	Background Mean Plus Two Standard Deviations	Unit
CD44-017	750126.729	2083464.618	11.0	11.3	Americium-241	3.3	NA	76	0.020	pCi/g
CD44-017	750126.729	2083464.618	11.0	11.3	Plutonium-239/240	10	NA	50	0.020	pCi/g
CD44-018	750125.263	2083458.306	11.0	11.3	Americium-241	5.7	NA	76	0.020	pCi/g
CD44-018	750125.263	2083458.306	11.0	11.3	Plutonium-239/240	20.9	NA	50	0.020	pCi/g
CE43-000	750054.497	2083555.328	6.5	7.1	Uranium-235	0.141	NA	8	0.120	pCi/g
CE43-000	750054.497	2083555.328	6.5	7.1	Uranium-238	1.817	NA	351	1.490	pCi/g
CE43-000	750054.497	2083555.328	8.5	10.1	Ethylbenzene	6.46	5.83	4250000	NA	µg/kg
CE43-000	750054.497	2083555.328	8.5	10.1	Toluene	6.91	5.83	31300000	NA	µg/kg
CE43-000	750054.497	2083555.328	8.5	10.1	Uranium-235	0.185	NA	8	0.120	pCi/g
CE43-000	750054.497	2083555.328	8.5	10.1	Xylene	41.7	11.7	2040000	NA	µg/kg
CE43-000	750054.497	2083555.328	10.5	11.5	Uranium-235	0.159	NA	8	0.120	pCi/g
CE43-000	750054.497	2083555.328	14.7	15.8	Uranium-235	0.175	NA	8	0.120	pCi/g
CE43-000	750054.497	2083555.328	16.5	18.5	Uranium-235	0.152	NA	8	0.120	pCi/g
CE43-000	750054.497	2083555.328	18.5	20.5	Uranium-234	4.585	NA	300	2.640	pCi/g
CE43-000	750054.497	2083555.328	18.5	20.5	Uranium-235	0.240	NA	8	0.120	pCi/g
CE43-000	750054.497	2083555.328	18.5	20.5	Uranium-238	4.585	NA	351	1.490	pCi/g
CE43-000	750054.497	2083555.328	20.5	22.4	Uranium-234	4.066	NA	300	2.640	pCi/g
CE43-000	750054.497	2083555.328	20.5	22.4	Uranium-235	0.175	NA	8	0.120	pCi/g
CE43-000	750054.497	2083555.328	20.5	22.4	Uranium-238	4.066	NA	351	1.490	pCi/g
CE43-001	750149.154	2083546.442	0.0	0.5	Uranium-235	0.128	NA	8	0.120	pCi/g
CE43-001	750149.154	2083546.442	0.5	2.5	Naphthalene	29.7	5.47	3090000	NA	µg/kg
CE43-002	750053.000	2083541.000	0.0	0.5	Acetone	14	5.8	102000000	NA	µg/kg
CE43-002	750053.000	2083541.000	0.0	0.5	Aluminum	20000	NA	228000	16902.000	mg/kg
CE43-002	750053.000	2083541.000	0.0	0.5	Barium	180	NA	26400	141.260	mg/kg
CE43-002	750053.000	2083541.000	0.0	0.5	Beryllium	1.6	NA	921	0.966	mg/kg
CE43-002	750053.000	2083541.000	0.0	0.5	Chromium	23	NA	268	16.990	mg/kg
CE43-002	750053.000	2083541.000	0.0	0.5	Copper	60	NA	40900	18.060	mg/kg
CE43-002	750053.000	2083541.000	0.0	0.5	Methylene chloride	2.2	1	2530000	NA	µg/kg
CE43-002	750053.000	2083541.000	0.0	0.5	Nickel	20	NA	20400	14.910	mg/kg

Location Code	Northing	Easting	Sample Starting Depth (ft bgs)	Sample Ending Depth (ft bgs)	Analyte	Result	RL	WRW AL	Background Mean Plus Two Standard Deviations	Unit
CE43-002	750053.000	2083541.000	0.0	0.5	Strontium	97	NA	613000	48.940	mg/kg
CE43-002	750053.000	2083541.000	0.0	0.5	Vanadium	78	NA	7150	45.590	mg/kg
CE43-002	750053.000	2083541.000	0.5	1.5	Acetone	16	5.6	102000000	NA	µg/kg
CE43-002	750053.000	2083541.000	0.5	1.5	Methylene chloride	2	0.98	2530000	NA	µg/kg
CE43-002	750053.000	2083541.000	0.5	1.5	Uranium-235	0.14	NA	8	0.120	pCi/g
CE43-003	750068.022	2083534.546	19.5	20.5	MCP	960	NA	NA	NA	µg/kg
CE43-003	750068.022	2083534.546	19.5	20.5	Naphthalene	19	6.42	3090000	NA	µg/kg
CE43-003	750068.022	2083534.546	19.5	20.5	Xylene	14.9	12.8	2040000	NA	µg/kg
CE43-003	750068.022	2083534.546	21.5	22.5	Ethylbenzene	8.81	6.04	4250000	NA	µg/kg
CE43-003	750068.022	2083534.546	21.5	22.5	MCP	830	NA	NA	NA	µg/kg
CE43-003	750068.022	2083534.546	21.5	22.5	Toluene	10.6	6.04	31300000	NA	µg/kg
CE43-003	750068.022	2083534.546	21.5	22.5	Xylene	46.1	12.1	2040000	NA	µg/kg
CE43-021	750075.377	2083513.984	12.0	13.0	Americium-241	0.678	NA	76	0.020	pCi/g
CE43-021	750075.377	2083513.984	12.0	13.0	Plutonium-239/240	3.866	NA	50	0.020	pCi/g
CE43-022	750075.377	2083513.984	8.0	9.0	Americium-241	1.474	NA	76	0.020	pCi/g
CE43-022	750075.377	2083513.984	8.0	9.0	Plutonium-239/240	8.402	NA	50	0.020	pCi/g

Results exceeding the WRW AL are indicated in bold.

Italics indicate results for plutonium-239/240 and uranium-234 that were calculated based on gamma spectroscopy (HPGe) results for other analytes.

Table 4
IHSS Group 500-3 Surface Soil Summary Statistics

Analyte	Total Number of Samples Analyzed	Detection Frequency	Average Result	Maximum Result	RL	Background Mean Plus Two Standard Deviations	WRW AL	Unit
1,2,4-Trichlorobenzene	22	4.5%	1.000	1.000	0.760	NA	9230000	µg/kg
4-Methyl-2-pentanone	22	4.5%	5.100	5.100	4.200	NA	16400000	µg/kg
Acetone	22	13.6%	16.333	18.000	5.500	NA	102000000	µg/kg
Aluminum	19	26.3%	19400.000	22000.000	NA	16902.000	228000	mg/kg
Americium-241	24	12.5%	403.760	1200.000	NA	0.023	76	pCi/g
Antimony	22	13.6%	0.530	0.580	NA	0.470	409	mg/kg
Arsenic	22	9.1%	18.700	19.700	NA	10.090	22.2	mg/kg
Barium	22	18.2%	651.750	909.000	NA	141.260	26400	mg/kg
Beryllium	19	21.1%	1.300	1.600	NA	0.966	921	mg/kg
Chromium	22	36.4%	29.313	54.900	NA	16.990	268	mg/kg
Cobalt	22	36.4%	17.263	26.000	NA	10.910	1550	mg/kg
Copper	22	40.9%	57.111	155.000	NA	18.060	40900	mg/kg
Iron	22	18.2%	33400.000	41600.000	NA	18037.000	307000	mg/kg
Lithium	19	5.3%	13.000	13.000	NA	11.550	20400	mg/kg
Manganese	22	18.2%	751.750	1280.000	NA	365.080	3480	mg/kg
Methylene chloride	22	9.1%	2.400	2.600	1.000	NA	2530000	µg/kg
Naphthalene	22	9.1%	4.340	6.880	3.270	NA	3090000	µg/kg
Nickel	22	36.4%	32.325	59.800	NA	14.910	20400	mg/kg
Plutonium-239/240	24	16.7%	2050.160	8130.000	NA	0.066	50	pCi/g
Strontium	22	27.3%	149.500	246.000	NA	48.940	613000	mg/kg
Tin	22	18.2%	16.175	30.400	NA	2.900	613000	mg/kg
Trichloroethene	22	4.5%	2.300	2.300	0.930	NA	19600	µg/kg
Uranium-234	24	50.0%	3.728	5.139	NA	2.253	300	pCi/g
Uranium-235	24	62.5%	0.204	0.264	NA	0.094	8.0	pCi/g
Uranium-238	24	50.0%	3.644	5.139	NA	2.000	351	pCi/g
Vanadium	22	18.2%	84.475	111.000	NA	45.590	7150	mg/kg
Xylene	22	22.7%	20.420	39.900	9.120	NA	2040000	µg/kg
Zinc	22	18.2%	103.200	130.000	NA	73.760	307000	mg/kg

Table 5
IHSS Group 500-3 Subsurface Soil Summary Statistics

Analyte	Total Number of Samples Analyzed	Detection Frequency	Average Result	Maximum Result	RL	Background Mean Plus Two Standard Deviations	WRW AL	Unit
2-Butanone	54	1.9%	1.900	1.900	1.800	NA	192000000	µg/kg
4-Methyl-2-pentanone	54	1.9%	62.600	62.600	55.900	NA	16400000	µg/kg

44/

Analyte	Total Number of Samples Analyzed	Detection Frequency	Average Result	Maximum Result	RL	Background Mean Plus Two Standard Deviations	WRW AL	Unit
Acetone	54	3.7%	13.500	16.000	3.600	NA	102000000	µg/kg
Americium-241	91	29.7%	14.967	317.500	NA	0.020	76	pCi/g
Arsenic	55	5.5%	15.500	16.500	NA	13.140	22	mg/kg
Barium	55	5.5%	729.667	751.000	NA	289.380	26400	mg/kg
Chromium	55	1.8%	140.000	140.000	NA	68.270	268	mg/kg
Ethylbenzene	54	9.3%	8.658	18.800	4.624	NA	4250000	µg/kg
Iron	55	3.6%	45450.000	48200.000	NA	41046.520	307000	mg/kg
Lead	55	1.8%	27.000	27.000	NA	24.970	1000	mg/kg
Methylene chloride	54	3.7%	2.200	2.400	0.670	NA	2530000	µg/kg
Naphthalene	54	3.7%	24.350	29.700	5.945	NA	3090000	µg/kg
Plutonium-239/240	91	30.8%	81.668	1809.750	NA	0.020	50	pCi/g
Styrene	54	1.9%	0.099	0.099	0.081	NA	123000000	µg/kg
Toluene	54	7.4%	14.403	27.400	5.638	NA	31300000	µg/kg
Trichloroethene	54	7.4%	16.225	29.900	4.575	NA	19600	µg/kg
Uranium-234	91	20.9%	4.013	4.637	NA	2.640	300	pCi/g
Uranium-235	91	49.5%	0.171	0.296	NA	0.120	8	pCi/g
Uranium-238	91	30.8%	3.312	4.637	NA	1.490	351	pCi/g
Vanadium	55	1.8%	99.500	99.500	NA	88.490	7150	mg/kg
Xylene	54	20.4%	42.675	116.000	10.172	NA	2040000	µg/kg

2.3 SORs

RFCA radionuclide SORs were calculated for soil at sampling locations in IHSS Group 500-3 using accelerated action soil data for samples up to 3 ft bgs. Radionuclide SOR calculations include americium-241, plutonium-239/240, uranium-234, uranium-235, and uranium-238, and SORs were calculated where any radionuclide result was greater than background means plus two standard deviations. Where HPGe-detection gamma spectroscopy was used for the analysis, the plutonium-239/240 activity was calculated as 5.7 times the measured americium-241 activity. Radionuclide SORs for characterization samples are presented in Table 6. SORs for confirmation samples are presented in Section 4.0. All radionuclide SORs were less than 1, except for the 0- to 0.5-ft sample from CD44-005, which had a radionuclide SOR over 85. Although radionuclide SORs were not tabulated for historical samples, a review of historical sampling data indicates none of the historical soil samples collected at IHSS Group 500-3 would have a radionuclide SOR greater than 1.

Nonradionuclide SORs were calculated for surface (0 to 0.5 ft bgs) soil samples. Only analytes detected above 10 percent of their WRW AL were included in the summation. Aluminum, arsenic, iron, manganese, and polynuclear aromatic hydrocarbons (PAHs) can be included in the calculation if they are indicated as possible contaminants by historical information or process knowledge. Otherwise they are generally omitted. Nonradionuclide SORs are presented in Table 7. All are less than 1.

45/

Table 6
IHSS Group 500-3 Radionuclide SORs

Location Code	Sample Starting Depth (ft bgs)	Sample Ending Depth (ft bgs)	SOR
CC43-001	0.5	1	0.01560
CC44-000	0	0.5	0.04786
CC44-000	0.5	0.9	0.04109
CC44-001	0	0.5	0.03748
CC44-001	0.5	1	0.04944
CC44-002	0	0.5	0.05244
CC44-002	0.5	0.9	0.06410
CC44-003	0	0.5	0.05705
CD43-002-01	0.5	2.5	0.05690
CD43-003	0.5	2.5	0.01776
CD43-004	0	0.5	0.02419
CD43-005	0	0.5	0.06236
CD43-006	0	0.5	0.01585
CD43-007	0	0.5	0.02000
CD43-007	0.5	1	0.03942
CD43-008	0	0.5	0.03005
CD43-009	1.2	1.6	0.01675
CD43-014	0	0.5	0.05022
CD43-015	0	0.5	0.00119
CD43-016	0	0.5	0.05438
CD43-016	0.5	2.5	0.05572
CD43-017	0	0.5	0.04447
CD43-017	0.5	0.8	0.00466
CD43-025	0	0.5	0.01216
CD43-026	0	0.5	0.04324
CD43-027	0	0.5	0.06033
CD43-028	0	0.5	0.04220
CD43-035	2	2.3	0.01558
CD43-041	0	4	0.02618
CD44-001	0	0.5	0.05477
CD44-001	0.5	2.5	0.05461
CD44-002	0	0.5	0.04583
CD44-003	0	0.5	0.04929
CD44-003	0.5	1	0.04928
CD44-005	0	0.5	85.88605
CD44-011	5	5.3	0.01759
CE43-001	0	0.5	0.01595
CE43-002	0.5	1.5	0.01750

46/

Table 7
IHSS Group 500-3 Nonradionuclide SORs for Surface Soil Samples

Location	Sample Starting Depth (ft bgs)	Sample Ending Depth (ft bgs)	SOR
CC43-000	0.0	0.4	0.12090
CD43-004	0.0	0.5	0.20485
CD43-008	0.0	0.5	0.16493

Nonradionuclide SORs for historical sampling locations were not tabulated but were qualitatively considered. None of the historic sampling locations would have a nonradionuclide SOR greater than 1 unless benzo(a)pyrene is considered. The surface soil sample from sampling location 01895 would have a nonradionuclide SOR greater than 1 if benzo(a)pyrene is included, but neither historical information or process knowledge indicate PAHs are likely to be present as process-related contaminants in this area. Asphalt pavement was present in the area of sampling location 01895 and probably was the source of the benzo(a)pyrene.

3.0 ACCELERATED ACTION

Accelerated action activities are discussed below. The discussion includes identification of potential sources of contamination, remediation goals, and soil removal. Starting and ending dates of significant IHSS Group 500-3 accelerated action activities are listed in Table 8.

Table 8
IHSS Group 500-3 Accelerated Action Activities

Activity	Starting Date	Ending Date	Duration
IASAP Addendum #IA-03-12 Characterization Sampling	10/15/03	09/13/04	334 days (intermittent)
Excavation of Building 528	01/03/05	01/20/05	17 days
Additional Characterization Sampling at Building 528	01/19/05	01/24/05	5 days
Backfilling Excavation at Building 528	01/20/05	01/25/05	5 days
Excavation of Building 559 Slab, Removal of Associated OPWL, and Supplemental Characterization Sampling	03/15/05	04/15/05	29 days
Excavation of Building 559 Tunnel	04/04/05	04/11/05	7 days
Excavation of Room 130 (CD44-005) Hot Spot and Confirmation Sampling	03/15/05	04/14/05	30 days (intermittent)
Excavation of Air Tunnel Hot Spot and Confirmation Sampling	04/07/05	04/08/05	1 day
Excavation of Building 561	03/16/05	03/27/05	11 days

47/

Activity	Starting Date	Ending Date	Duration
Backfilling of Excavation at Building 561	03/28/05	03/30/05	2 days
B528-B559 Manway Hot Spot Removal and Confirmation Sampling	01/05/05	03/23/05	77 days (intermittent)
Backfilling Excavations at Building 559	04/16/05	05/26/05	40 days (intermittent)

Source: Personal Communication, Robert Ferrera, May 24, 2005

3.1 Evaluation of WRW AL Exceedances

IHSS Group 500-3 historical and accelerated action results that exceeded WRW ALs are presented in Table 9.

Table 9
IHSS Group 500-3 Historical and Accelerated Action WRW AL Exceedances in Soil

Area	Location Code	Depth Interval (ft bgs)	Analyte	Result	WRW AL	Background Mean Plus Two Standard Deviations	Unit
Manway Hot Spot	CD43-054	7.5-7.8	Americium-241	317.5	76	0.020	pCi/g
	CD43-054	7.5-7.8	Plutonium-239/240	1809.8	50	0.020	pCi/g
Room 130 Hot Spot	CD44-005	0-0.5	Americium-241	1200	76	0.0227	pCi/g
	CD44-005	0-0.5	Plutonium-239/240	8130	50	0.066	pCi/g
Air Tunnel Hot Spot	CD44-009	5.0-5.3	Plutonium-239/240	60.534	50	0.020	pCi/g
	CD44-012	9.0-9.3	Plutonium-239/240	74.67	50	0.020	pCi/g
	CD44-015	9.0-9.3	Plutonium-239/240	157.83	50	0.020	pCi/g
NW of Building 528	01895	0.0-0.5	Benzo(a)pyrene	10000	3490	NA	µg/kg

Radionuclide activities in surface soil (0.0 to 0.5 ft bgs) exceeded WRW ALs at one accelerated action characterization sampling location beneath the Building 559 slab (CD44-005). The remaining radionuclide exceedances were of plutonium-239/240 or americium-241 at depths ranging from 5.0 to 9.3 ft bgs. RFCA does not require remediation of these exceedances because they are deeper than 3 ft below the final grade and less than 3 nanocuries per gram (nCi/g) activity. As discussed in Section 3.3, these exceedances were remediated as best management practices (BMPs) based on an as low as reasonably achievable (ALARA) evaluation.

A benzo(a)pyrene exceedance occurred in a historical sample collected near Building 528. The exceedance was isolated from other benzo(a)pyrene detections and was less than three times the WRW AL. Asphalt pavement in the immediate area of the exceedance was considered to be the source of the benzo(a)pyrene. Based on the Elevated Measurements Comparison (EMC), this location did not require remediation. However, the asphalt in the area was removed as part of Building 559 Decontamination and Decommissioning (D&D), and soil in the area was removed during the removal of the underground vault at Building 528, which involved the excavation of a pit more than

48/

20 ft deep around Building 528. Soil associated with the benzo(a)pyrene exceedance was removed incidentally as a result of these activities.

3.2 RAOs and Accelerated Action Goals

ER RSOP RAOs and accelerated action goals were established for the remediation of soil at IHSS Group 500-3 sites. The RAOs stated in ER RSOP Notification #05-02 (DOE 2005a) are as follows:

- Remove portions of the Building 559 slab and associated tunnels (the 200-ft-long east-west tunnel as well as the tunnel connecting to Building 561) as necessary to remove the facility to at least 3 ft below final grade and as agreed to through consultation with the Colorado Department of Public Health and Environment (CDPHE).
- Remove asbestos-containing material (i.e., transite) encountered during slab removal. Dispose appropriately based on waste characterization results.
- Remove foundation, sanitary, and storm drains within 3 ft of final grade.
- Remove OPWL drains and piping within 3 ft of the final grade in accordance with ER RSOP Notification #03-14 (DOE 2003b) and RFCA Attachment 14 (DOE et al. 2003). Remove any OPWL piping and associated soil found during slab removal. OPWL piping that is deeper than 3 ft below the final grade will be disrupted, drained, and grouted.
- To address contamination detected at CD44-005 and any other contamination found during slab removal, remove soil with plutonium-239/240 or americium-241 activities greater than the RFCA WRW AL to a depth of 3 ft bgs or to the applicable AL, whichever comes first. If activities are greater than 3 nCi/g between 3 and 6 ft bgs, characterize and remediate in accordance with RFCA Attachment 5 (DOE et al. 2003). If plutonium-239/240 or americium-241 is present deeper than 6 ft at activities greater than the RFCA WRW AL, conduct an SSRS.
- Where contaminated soil is removed, collect confirmation soil samples in accordance with the IA and Buffer Zone (BZ) SAP (IABZSAP) (DOE 2004c).

By accomplishing the above objectives, the following remediation goals are achieved:

- Provide a remedy consistent with the RFETS goal of protection of human health and the environment;
- Provide a remedy that minimizes the need for long-term maintenance and institutional or engineering controls; and
- Minimize the spread of contaminants during implementation of accelerated actions.

It is understood that after remediation there may be areas of soil with concentrations of metals, radionuclides, and organics greater than background means plus two standard deviations, or MDLs or RLs, but below RFCA WRW ALs.

3.3 D&D Activities

D&D activities at IHSS Group 500-3 included the following:

- Building 528 was completely removed.
- Building 559 was demolished and its slab and footers were completely removed.
- Building 561 was demolished and completely removed.
- The air tunnel beneath Building 559 and the tunnel connecting Buildings 559 and 561 were completely removed.
- A manway between Buildings 559 and 528 was completely removed.
- All OPWL and New Process Waste Lines (NPWL) beneath and adjacent to Buildings 559 and 528 were removed.
- All sanitary and storm drain lines beneath and adjacent to Buildings 559 and 528 were removed.
- All water supply lines beneath and adjacent to Buildings 559 and 528 were removed, however three manways associated with water supply lines on the north side of Building 559 were left in place.

IHSS Group 500-3 features removed as part of D&D are shown on Figure 6.

3.4 Accelerated Action Soil Removal Activities











Accelerated action soil removal activities were conducted in accordance with ER RSOP Notification #05-02 (DOE 2005a).

Excavation at the CD44-005 (Room 130) hot spot began in mid-March 2005 after a portion of the slab overlying the hot spot was removed. Contaminated soil was removed and sampling indicated that soil in the northern and eastern sidewalls of the excavation was below WRW ALs; however, plutonium activities in the bottom of the excavation exceeded the WRW AL. After slab removal was completed, excavation of the hot spot resumed and the results of confirmation samples collected from the four sidewalls and bottom of the excavation on April 13, 2005 demonstrated that the hot spot had been removed.

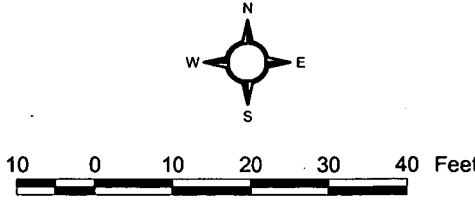
The two remaining hot spots identified during OPWL removal were both deeper than 3 ft below the final grade, and were remediated as BMPs even though they did not require remediation under RFCA. The hot spot adjacent to the Building 559 air tunnel was remediated, and confirmation sampling took place on April 7 and 8, 2005. The hot spot

Figure 6
IHSS Group 500-3
Features Removed

KEY

-  Original process waste line (removed)
-  New process waste line (removed)
-  Storm drain (removed)
-  Sanitary sewer (removed)
-  Water supply line (removed)
-  Water supply manway (not removed)
-  Soil hot spot
-  Demolished building
-  Standing building
-  Building 559 floor plan


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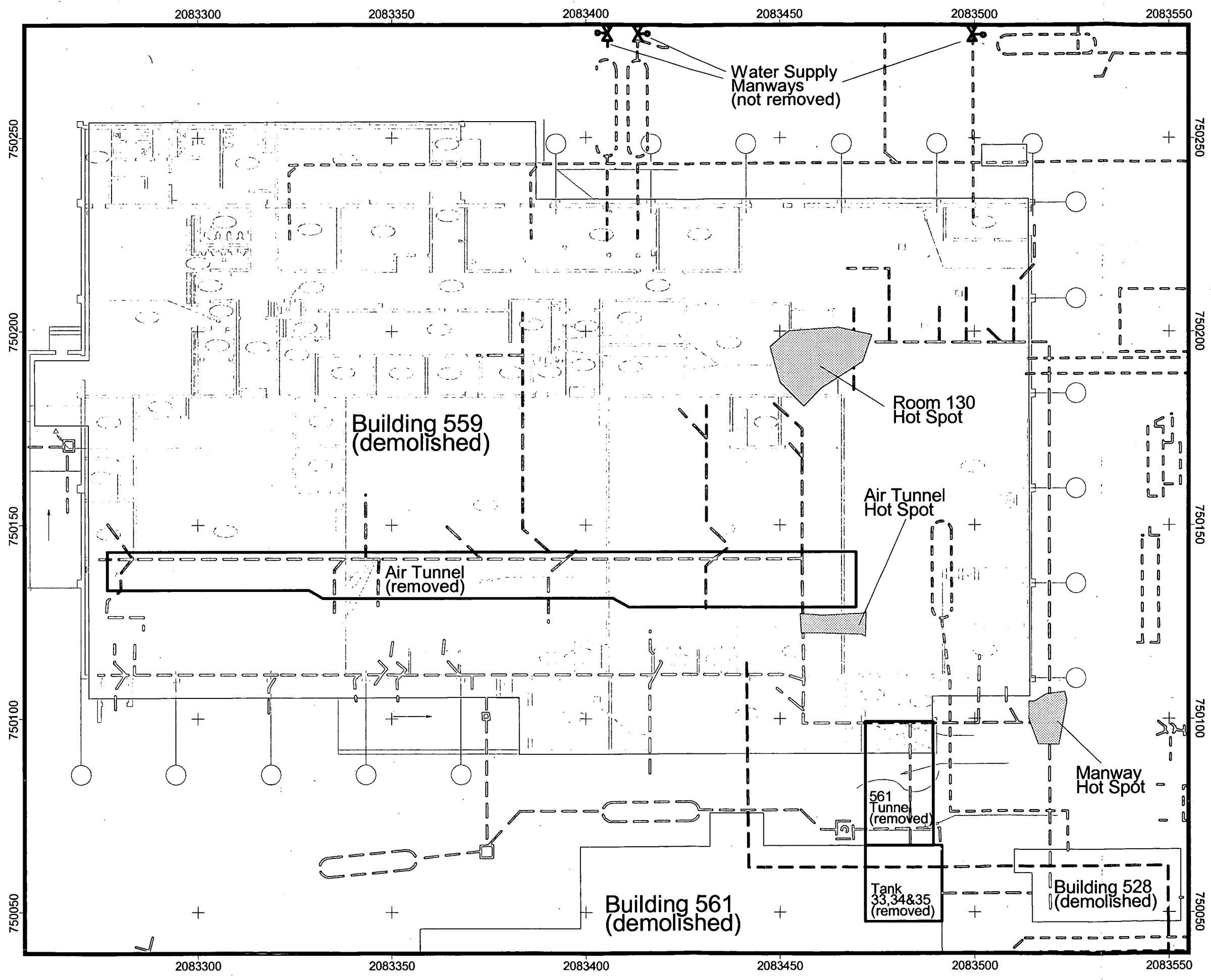
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Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Date: 06/15/05

Prepared by: 

Prepared for: 



511

beneath the manway between Buildings 559 and 528 was discovered on April 13, 2005 and remediated on April 14, 2005. A confirmation sample was collected on April 14, indicating the remediation was complete. The confirmation sample was analyzed for both radionuclides and VOCs.

Figure 7 shows the excavation boundaries resulting from soil removal activities at Buildings 528 and 559.

4.0 CONFIRMATION SAMPLING

Confirmation samples were collected at each of the three hot spots that were excavated in IHSS Group 500-3. Field screening samples were collected routinely during excavation and were analyzed on site by HPGe gamma spectroscopy. The results of field screening samples were used to guide the progress of excavation and ensure that contaminated soil was accurately targeted for removal. All confirmation samples were analyzed for radionuclides by both alpha and gamma spectroscopy. Because plutonium-239/240 and americium-241 were the only contaminants above ALs at these locations prior to remediation, confirmation samples did not need to be analyzed for other analyte groups. Two confirmation samples were collected at the CD44-005 hot spot prior to the complete removal of the Building 559 slab. After complete slab removal, excavation continued and five additional confirmation samples were collected. Five confirmation samples were collected at the hot spot located south of the eastern end of the air tunnel. One confirmation sample was collected at the hot spot excavated beneath the manway between Buildings 559 and 528. This sample was analyzed for both radionuclides and VOCs.

Confirmation sampling and analysis were conducted in accordance with the IABZSAP (DOE 2004c). Confirmation samples are included in the actual sampling totals presented in Table 1 and in the sampling and analysis specifications in Table 2. Confirmation sampling results are incorporated in the summary statistics presented in Tables 4 and 5. Confirmation sample depths reflect the actual depth excavated at the sampling location. Because excavations may have irregular bottoms or may slope downward from the sidewalls to the center, there may be depth differences between sidewall samples and samples collected in the center of an excavation.

Analytical results greater than background means plus two standard deviations are shown on Figure 7 and presented in Table 10. All radionuclide activities in confirmation samples were less than WRW ALs based on alpha spectroscopy results. Plutonium was the only analyte detected in the confirmation samples at activities greater than 10 percent of the WRW AL. Radionuclide SORs for confirmation samples, presented in Table 11, are all less than 1.

52/

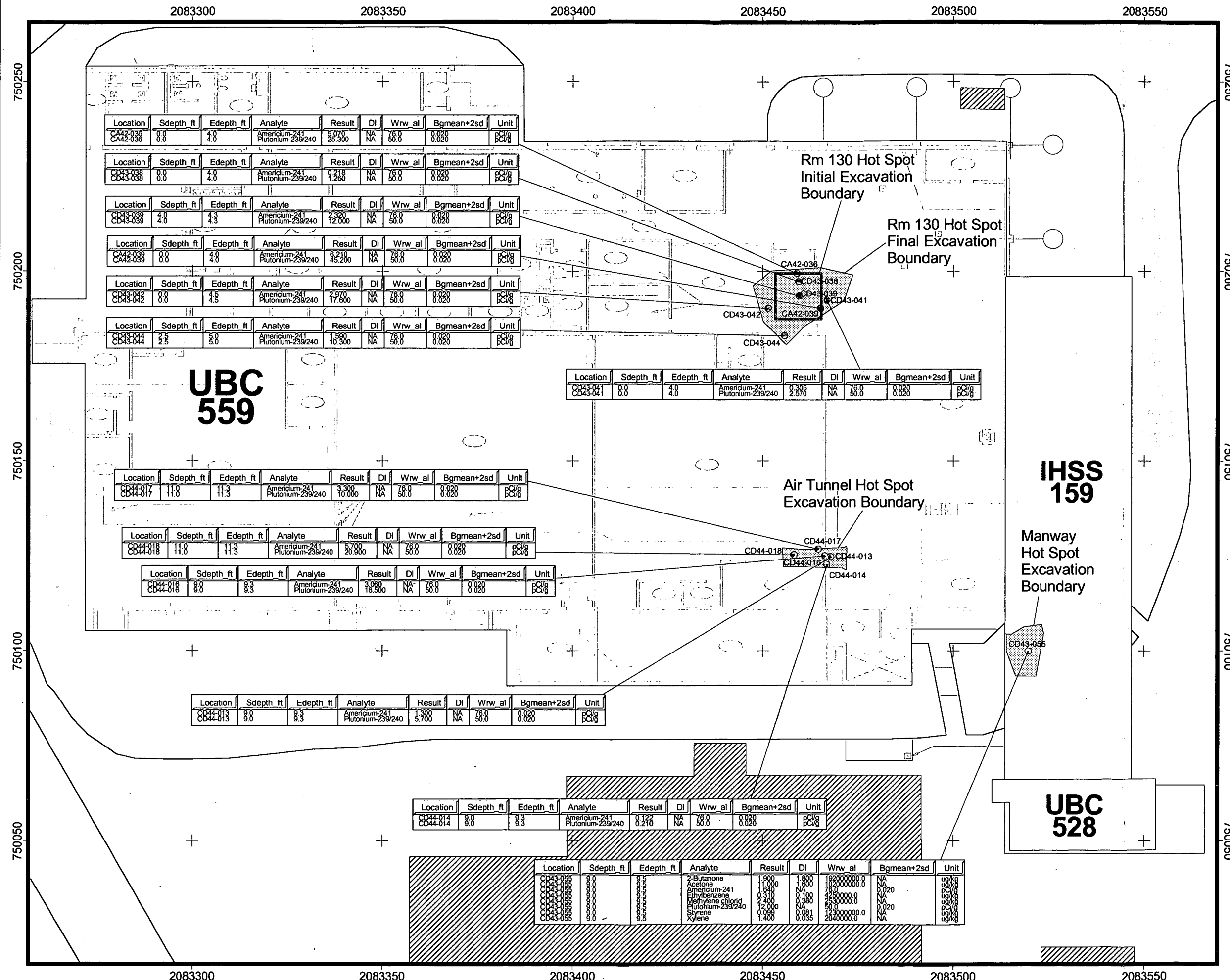


Figure 7
IHSS Group 500-3 Excavation
Boundaries and Confirmation
Sampling Data Greater Than RLs
or Background Means Plus Two
Standard Deviations

KEY

- Confirmation sampling location with results greater than RLs or background means plus two standard deviations
- ▨ Final hotspot excavation boundary
- ▭ Initial excavation boundary for Rm 130 hot spot prior to complete slab removal.
- ▭ UBCs 559 and 528
- ▭ IHSS 159
- Building 559 Floor Plan
- ▨ Demolished Building
- ▭ Standing Building
- ▭ Asphalt
- Dirt Roads

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10 0 10 20 30 40 Feet

Scale = 1:300

State Plane Coordinate Projection
 Colorado Central Zone
 Datum: NAD 27

U.S. Department of Energy
 Rocky Flats Environmental Technology Site

Date: 06/15/05

Prepared by: **RADMS**

Prepared for: **KAISER HILL COMPANY**

53/

Table 10
IHSS Group 500-3 Confirmation Sampling Results Greater Than RLs or
Background Means Plus Two Standard Deviations

Location Code	Location Description	Sample Depth Interval (ft bgs)	Analyte	Result	WRW AL	Background Mean Plus Two Standard Deviations	Unit
Building 559 Room 130 Hot Spot Excavation							
CA42-036	Northern side-wall (prior to slab removal)	0-4.0	Americium-241	5.070	76	0.020	pCi/g
			Plutonium-239/240	25.300	50	0.020	pCi/g
CA42-039	Eastern side-wall (prior to slab removal)	0-4.0	Americium-241	6.210	76	0.020	pCi/g
			Plutonium-239/240	45.200	50	0.020	pCi/g
CD43-038	Northern side-wall (after slab removal)	0-4.0	Americium-241	0.218	76	0.020	pCi/g
			Plutonium-239/240	1.260	50	0.020	pCi/g
CD43-039	Center of excavation (after slab removal)	4.0-4.3	Americium-241	2.320	76	0.020	pCi/g
			Plutonium-239/240	12.000	50	0.020	pCi/g
CD43-041	Eastern side-wall (after slab removal)	0-4.0	Americium-241	0.306	76	0.020	pCi/g
			Plutonium-239/240	2.570	50	0.020	pCi/g
CD43-042	Western side-wall (after slab removal)	0-4.5	Americium-241	2.970	76	0.020	pCi/g
			Plutonium-239/240	17.600	50	0.020	pCi/g
CD43-044	Southern side-wall (after slab removal)	2.5-5.0	Americium-241	1.590	76	0.020	pCi/g
			Plutonium-239/240	10.300	50	0.020	pCi/g
Manway Hot Spot Excavation							
CD43-055	Center of Excavation	9.0-9.5	Americium-241	1.640	76	0.020	pCi/g
			Plutonium-239/240	12.000	50	0.020	pCi/g
			Acetone	11.000	102000000	NA	µg/kg
			2-Butanone	1.900	192000000	NA	µg/kg
			Ethylbenzene	0.310	4250000	NA	µg/kg
			Methylene chloride	2.400	2530000	NA	µg/kg
			Styrene	0.099	123000000	NA	µg/kg
			Xylene	1.400	2040000	NA	µg/kg
Air Tunnel Hot Spot Excavation							
CD44-013	Eastern sidewall	9.0-9.3	Americium-241	1.300	76	0.020	pCi/g
			Plutonium-239/240	5.700	50	0.020	pCi/g
CD44-014	Southern sidewall	9.0-9.3	Americium-241	0.122	76	0.020	pCi/g
			Plutonium-239/240	0.210	50	0.020	pCi/g
CD44-016	Center of excavation	9.0-9.3	Americium-241	3.060	76	0.020	pCi/g
			Plutonium-239/240	18.500	50	0.020	pCi/g
CD44-017	Northern sidewall	11-11.3	Americium-241	3.300	76	0.020	pCi/g
			Plutonium-239/240	10.000	50	0.020	pCi/g

54/

Location Code	Location Description	Sample Depth Interval (ft bgs)	Analyte	Result	WRW AL	Background Mean Plus Two Standard Deviations	Unit
CD44-018	Western sidewall	11-11.3	Americium-241	5.700	76	0.020	pCi/g
			Plutonium-239/240	20.900	50	0.020	pCi/g

Table 11
Confirmation Sample Radionuclide SORs

Location Code	Sample Starting Depth (ft bgs)	Sample Ending Depth (ft bgs)	SOR
CA42-036	0	4	0.28481
CA42-039	0	4	0.47137
CD43-038	0	4	0.01373
CD43-042	0	4.5	0.19080
CD43-044	2.5	5	0.10971

5.0 RCRA UNIT CLOSURE

Table 8 of the ER RSOP identifies the Resource Conservation and Recovery Act (RCRA) units to be closed as part of ER accelerated actions (DOE 2004a). None of the listed RCRA units is located in IHSS Group 500-3.

6.0 POST-ACCELERATED ACTION CONDITIONS

Figures 8, 9, and 10 show the distribution of residual contamination in soil at IHSS Group 500-3 based on accelerated action characterization and confirmation sampling results, as well as historical data. Soil was removed at three hot spots and the excavations were backfilled with clean Site soil. Analytical results of the confirmation sampling of the excavations indicate radionuclide activities are below WRW ALs.

As Figures 8, 9, and 10 indicate, residual contaminant concentrations and activities are less than WRW ALs throughout IHSS Group 500-3; however, concentrations and activities exceeding background means plus two standard deviations (inorganics) or RLs (organics) are still present.

7.0 SSRS

The SSRS follows the steps identified on Figure 3 of Attachment 5 of RFCA (DOE et al. 2003).

55

Screen 1 – Are contaminant of concern (COC) concentrations below WRW Soil Action Levels?

Yes. As Figures 8, 9, and 10 indicate, residual COC concentrations in surface and subsurface soil are below WRW ALs. Screens 2 and 3 of the SSRS are therefore omitted.

Screen 4 – Is there an environmental pathway and sufficient quantity of COCs that would cause an exceedance of the surface water standards?

Based on the maps of residual contamination (Figures 8, 9, and 10), there is no significant contaminant source remaining in IHSS Group 500-3 following D&D and accelerated action. IHSS Group 500-3 is not located in an area of high erosion as shown in RFCA Attachment 5, Figure 1 (DOE et al. 2003). Moreover, erosion controls will be incorporated as part of the final ground surface reconfiguration in this area, and ongoing surface water quality monitoring will continue to ensure the long-term effectiveness of the accelerated action for protecting surface water.

Groundwater beneath IHSS Group 500-3 is part of the IA VOC Plume, which is being evaluated as part of the Groundwater Interim Measure/Interim Remedial Action (IM/IRA). Residual soil data for IHSS Group 500-3 (Figures 8, 9, and 10) do not indicate the presence of VOC sources in this area.

8.0 STEWARDSHIP EVALUATION

The IHSS Group 500-3 stewardship evaluation was based on current site conditions.

8.1 Current Site Conditions

Based on the accelerated action characterization and remediation activities, the following conditions exist at IHSS Group 500-3:

- Building 528 was completely removed.
- Building 559 was demolished and its slab and footers were completely removed.
- Building 561 was demolished and completely removed.
- The air tunnel beneath Building 559 and the tunnel connecting Buildings 559 and 561 were completely removed.
- A manway between Buildings 559 and 528 was completely removed.
- Plutonium- and americium-contaminated soil was excavated from three hot spots. Confirmation sampling demonstrated that activities in the remaining soil are less than WRW ALs.
- All excavations were backfilled with clean fill obtained on Site and the area has been regraded. Revegetation will follow.

59/

- All OPWL and NPWL beneath and adjacent to Buildings 559 and 528 were removed.
- All sanitary and storm drain lines beneath and adjacent to Buildings 559 and 528 were removed.
- All water supply lines beneath and adjacent to Buildings 559 and 528 were removed; however, three manways associated with water supply lines on the north side of Building 559 were left in place.

8.2 Near-Term Management Recommendations

Contaminant concentrations in soil remaining at IHSS Group 500-3 do not require additional accelerated action. Near-term management actions are recommended because residual contaminant concentrations greater than RLs or background means plus two standard deviations remain in surface and subsurface soil at the IHSS Group 500-3 sites. The following near-term management actions are recommended:

- Access to the sites will be restricted.
- Soil excavation will be controlled.
- Groundwater pumping will be prohibited.
- Restrictions on access to the sites, controls on soil excavation, and the prohibition on groundwater pumping will remain in force until long-term management actions are implemented.

8.3 Long-Term Stewardship Recommendations

Based on the remaining environmental conditions discussed above, the long-term stewardship actions recommended for the IHSS Group 500-3 sites are the same as the near-term management actions discussed above. Through the imposition of physical and institutional controls, site access and soil excavation will be restricted, and groundwater pumping will be prohibited. Additional environmental engineering or monitoring activities are not required or recommended for soil at IHSS Group 500-3. IHSS Group 500-3 will be evaluated as part of the Accelerated Action Ecological Screening Evaluation (AAESE) and Sitewide Comprehensive Risk Assessment (CRA). The CRA is part of the RCRA Facility Investigation/Remedial Investigation (RFI/RI) and Corrective Measures Study/Feasibility Study (CMS/FS) that will be conducted for RFETS. If additional long-term stewardship actions are determined to be necessary, they will be included in the preferred alternative that will be presented in the Proposed Plan. The final long-term stewardship actions recommended for IHSS Group 500-3 will be summarized in the Rocky Flats Long-Term Stewardship Strategy, and will be contained in the Corrective Action Decision/Record of Decision (CAD/ROD), any post-closure Colorado Hazardous Waste Act (CHWA) permit that may be required, and any post-RFCA agreement.

60/

9.0 DEVIATIONS FROM THE ER RSOP

There were no deviations from the ER RSOP. In addition to activities governed by the ER RSOP, IHSS Group 500-3 underwent extensive D&D activities, including the demolition and complete removal of Buildings 528, 559, and 561, and associated subgrade structures and OPWLs. D&D was conducted in accordance with the RSOP for Facility Disposition (DOE 2004d) and the RSOP for Facility Component Removal, Size Reduction, and Decontamination (DOE 2003c).

10.0 WASTE MANAGEMENT

Waste materials generated as part of the IHSS Group 500-3 accelerated action slab and soil removal included soil, concrete, nonfriable asbestos, and glass (Pyrex) piping. Contaminated soil, concrete, and asbestos associated with the removal of subgrade structures, such as the Building 559 slab and footers, were counted as remediation waste, while subgrade OPWL piping (typically Pyrex) was tracked as D&D waste, along with all concrete, metal, and asbestos debris associated with the demolition of the above-grade structure. Table 12 summarizes wastes associated with the accelerated action slab and soil removal at IHSS Group 500-3. With the exception of OPWL piping, wastes tracked as D&D wastes are not tabulated. Partway through the project, wastes from IHSS Group 500-3 began to be transferred to Building 776 to be packaged and handled with wastes from that project. Approximately 3,830 cubic yards of ER soil and concrete waste were transferred from IHSS Group 500-3 to Building 776.

Table 12
IHSS Group 500-3 Accelerated Action Slab and Soil Waste Removal Summary

Description	Type	Volume (cubic yards)	Containers
Soil	LLW	88	7 IML containers
Concrete	LLW	409	23 IML containers
Concrete and Nonfriable Asbestos	LLW	18	1 IML container
Piping, Glass, Transite (D&D waste)	LLW	46	3 IML containers
Soil	LLW	1532	Transferred to Building 776
Concrete	LLW	2298	Transferred to Building 776

11.0 SITE RECLAMATION

The excavations associated with soil remediation were surveyed and backfilled with clean Site soil. The excavations associated with D&D activities were also backfilled with clean Site soil. Documentation regarding backfilling is provided in an ER Regulatory Contact Record dated April 14, 2005 (Appendix A).

12.0 NLR SAMPLING LOCATIONS

The characterization data from eight sampling locations are considered NLR because the soil once present at those sampling locations was excavated and removed as a remedial

61/

action. The NLR sampling locations are listed in Table 13. For those locations listed that have multiple sample depths, all samples are NLR.

Table 13
NLR Sampling Locations

Location Code	Actual Northing	Actual Easting
CC43-030	750098.180	2083515.490
CD43-034	750198.392	2083468.364
CD43-054	750102.153	2083516.970
CD44-005	750184.640	2083459.240
CD44-009	750125.190	2083465.114
CD44-012	750126.916	2083466.281
CD44-015	750124.613	2083461.325
01895	750070.000	2083508.000

13.0 DQA

The data quality objectives (DQOs) for this project are described in the IASAP (DOE 2001). All DQOs for this project were achieved based on the following:

- Regulatory agency-approved sampling program design in accordance with the IASAP (DOE 2001) and IABZSAP (DOE 2004c);
- Collection of samples in accordance with the sampling design;
- Implementation of remediation activities in accordance with ER RSOP Notification #05-02 (DOE 2005a); and
- Results of the DQA, as described in the following sections.

13.1 DQA Process

The DQA process ensures that the type, quantity, and quality of environmental data used in decision making are defensible, and is based on the following guidance and requirements:

- U.S. Environmental Protection Agency (EPA), 1994a, Guidance for the Data Quality Objective Process, QA/G-4;
- EPA, 1998, Guidance for the Data Quality Assessment Process, Practical Methods for Data Analysis, QA/G-9; and
- DOE, 1999, Quality Assurance, Order 414.1A.

Verification and validation (V&V) of data are the primary components of the DQA. The final data are compared with original project DQOs and evaluated with respect to project decisions; uncertainty within the decisions; and quality criteria required for the data,

62/

specifically precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS). Validation criteria are consistent with the following RFETS-specific documents and industry guidelines:

- EPA, 1994b, USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, 540/R-94/012;
- EPA, 1994c, USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, 540/R-94/013;
- Kaiser-Hill Company, L.L.C. (K-H), 2002a, General Guidelines for Data Verification and Validation, DA-GR01-v2, October;
- K-H, 2002b, V&V Guidelines for Isotopic Determinations by Alpha Spectrometry, DA-RC01-v2, October;
- K-H, 2002c, V&V Guidelines for Volatile Organics, DA-SS01-v3, October;
- K-H, 2002d, V&V Guidelines for Semivolatile Organics, DA-SS02-v3, October;
- K-H, 2002e, V&V Guidelines for Metals, DA-SS05-v3, October; and
- K-H, 2002f, V&V Guidelines for Radiochemistry by Gamma Spectrometry DA-GAM-v1.
- Lockheed-Martin, 1997, Evaluation of Radiochemical Data Usability, ES/ER/MS-5.

This report will be submitted to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) AR for permanent storage 30 days after being provided to CDPHE and/or EPA.

13.2 V&V of Results

Verification ensures that data produced and used by the project are documented and traceable in accordance with ER Program requirements. Validation consists of a technical review of all data that directly support the project decisions so that any limitations of the data relative to project goals are identified and the associated data are qualified accordingly. The V&V process defines the criteria that constitute data quality, namely PARCCS parameters. Data traceability and archiving are also addressed. V&V criteria include the following:

- Chain-of-custody;
- Preservation and hold times;
- Instrument calibrations;

63/

- Preparation blanks;
- Interference check samples (metals);
- Matrix spikes/matrix spike duplicates (MS/MSDs);
- Laboratory control samples (LCSs);
- Field duplicate measurements;
- Chemical yield (radiochemistry);
- Required quantitation limits/minimum detectable activities (sensitivity of chemical and radiochemical measurements, respectively); and
- Sample analysis and preparation methods.

Evaluation of V&V criteria ensures that PARCCS parameters are satisfactory (that is, within tolerances acceptable to the project). V&V findings are captured through application of validation "flags" or qualifiers to individual records.

Raw hard-copy data (that is, individual analytical data packages) are currently filed by report identification number (RIN) and maintained by K-H Analytical Services Division (ASD). Older hard copies may reside at the Federal Center in Lakewood, Colorado. Electronic data are stored in the RFETS Soil-Water Database (SWD). Standardized real and QC data are included on the enclosed CD.

13.2.1 Accuracy

The following measures of accuracy were evaluated:

- LCSs;
- Surrogates;
- Field blanks; and
- Sample MSs.

Results are compared to method requirements and project goals. The results of these comparisons are summarized for RFCA COCs where uncertainty associated with analytical accuracy is potentially great enough to affect project decisions. Particular attention is paid to those results that approach ALs, where unacceptable QC results could indicate unacceptable levels of uncertainty for decision-making purposes.

LCS Evaluation

As indicated in Table 14, LCS analyses were run for all methods except gamma spectroscopy. When the In-Situ Counting System (ISOCs) technique is used for gamma spectroscopy, an internal standard approach is used instead of LCSs. The on-site

64/

laboratory that performs gamma spectroscopy uses ISOCS and is therefore not required to provide LCS data.

Table 14
LCS Summary

Test Method	Laboratory Batch	LCS Run?
ALPHA SPEC	3351162	Yes
ALPHA SPEC	3351171	Yes
ALPHA SPEC	3351176	Yes
ALPHA SPEC	357524	Yes
ALPHA SPEC	357526	Yes
ALPHA SPEC	357528	Yes
ALPHA SPEC	359219	Yes
ALPHA SPEC	360421	Yes
ALPHA SPEC	361139	Yes
ALPHA SPEC	366445	Yes
ALPHA SPEC	366446	Yes
ALPHA SPEC	366447	Yes
ALPHA SPEC	5028426	Yes
ALPHA SPEC	5028428	Yes
ALPHA SPEC	5028432	Yes
ALPHA SPEC	5082474	Yes
ALPHA SPEC	5082477	Yes
ALPHA SPEC	5082480	Yes
ALPHA SPEC	5103466	Yes
ALPHA SPEC	5103469	Yes
ALPHA SPEC	5103470	Yes
ALPHA SPEC	5107077	Yes
ALPHA SPEC	5107078	Yes
ALPHA SPEC	5107079	Yes
ALPHA SPEC	5109558	Yes
ALPHA SPEC	5109559	Yes
ALPHA SPEC	5109560	Yes
ALPHA SPEC	5113101	Yes
ALPHA SPEC	5116456	Yes
ALPHA SPEC	5116459	Yes
SW-846 6010	3290580	Yes
SW-846 6010	3292097	Yes
SW-846 6010	3294581	Yes
SW-846 6010	3294600	Yes
SW-846 6010	3295497	Yes
SW-846 6010	3295521	Yes
SW-846 6010	3296538	Yes
SW-846 6010	3296541	Yes
SW-846 6010	3350508	Yes
SW-846 6010	3350510	Yes

65/

Test Method	Laboratory Batch	LCS Run?
SW-846 6010	4225543	Yes
SW-846 6010	4225545	Yes
SW-846 6010	4229123	Yes
SW-846 6010	4229297	Yes
SW-846 6010	4230510	Yes
SW-846 6010	4232444	Yes
SW-846 6010	4232455	Yes
SW-846 6010	4232611	Yes
SW-846 6010	4232615	Yes
SW-846 6010	4233203	Yes
SW-846 6010	4259583	Yes
SW-846 6010	4264486	Yes
SW-846 6010	5109586	Yes
SW-846 6010	5111217	Yes
SW-846 8081	3295210	Yes
SW-846 8082	3295224	Yes
SW-846 8260	3351321	Yes
SW-846 8260	4225468	Yes
SW-846 8260	4229384	Yes
SW-846 8260	4264333	Yes
SW-846 8260	5112263	Yes
SW-846 8260	MS1 VOA_031017A	Yes
SW-846 8260	MS1 VOA_031021A	Yes
SW-846 8260	MS1 VOA_031022A	Yes
SW-846 8260	MS1 VOA_040809A	Yes
SW-846 8260	MS1 VOA_040811A	Yes
SW-846 8260	MS1 VOA_040812A	Yes
SW-846 8260	MS1 VOA_040817A	Yes
SW-846 8260	MS1 VOA_040901A	Yes
SW-846 8260	MS2 VOA_031016A	Yes
SW-846 8260	MS2 VOA_050411A	Yes
SW-846 8260	MS3 VOA_031021A	Yes
SW-846 8260	MS3 VOA_031022A	Yes
SW-846 8260	MS3 VOA_040809A	Yes
SW-846 8260	MS3 VOA_040811A	Yes
SW-846 8260	MS3 VOA_040816A	Yes
SW-846 8260	MS3 VOA_040816B	Yes
SW-846 8260	MS3 VOA_040902A	Yes

The minimum and maximum LCS results for IHSS Group 500-3 are tabulated by chemical in Table 15. LCS recoveries are not indicative of matrix effects because they are not prepared using site samples, but LCS results do indicate whether the laboratory may be introducing a bias in the results. LCS results outside of tolerances were reviewed to determine whether a potential bias might be indicated. Recoveries reported above the

upper limit may indicate the actual sample results are less than reported. Because this is environmentally conservative, no further evaluation is needed. The analytes with unacceptably low recoveries were evaluated further. If the highest sample result divided by the lowest LCS recovery for that analyte is less than the AL, no further evaluation is warranted because any indicated bias is not great enough to affect project decisions. Based on this analysis, the LCS recoveries for IHSS Group 500-3 did not indicate that project decisions had been affected.

Table 15
LCS Evaluation Summary

Test Method	CAS Number	Analyte	Minimum Percent Recovery	Maximum Percent Recovery
SW-846 8260	71-55-6	1,1,1-Trichloroethane	77.27	126
SW-846 8260	79-34-5	1,1,2,2-Tetrachloroethane	85	112.6
SW-846 8260	79-00-5	1,1,2-Trichloroethane	89	112
SW-846 8260	75-34-3	1,1-Dichloroethane	82.09	111.3
SW-846 8260	75-35-4	1,1-Dichloroethene	73.8	112
SW-846 8260	120-82-1	1,2,4-Trichlorobenzene	88.67	115.2
SW-846 8260	95-50-1	1,2-Dichlorobenzene	92	110.1
SW-846 8260	107-06-2	1,2-Dichloroethane	83.24	129
SW-846 8260	78-87-5	1,2-Dichloropropane	84.5	109.2
SW-846 8260	106-46-7	1,4-Dichlorobenzene	92	110.9
SW-846 8260	78-93-3	2-Butanone	44.72	136
SW-846 8081	50-29-3	4,4'-DDT	117	117
SW-846 8260	108-10-1	4-Methyl-2-pentanone	79.62	123
SW-846 8260	67-64-1	Acetone	41.05	176.4
SW-846 8081	309-00-2	Aldrin	103	103
SW-846 6010	7429-90-5	Aluminum	93	100
SW-846 6010	7440-36-0	Antimony	83	99
SW-846 8082	12674-11-2	Aroclor-1016	109	109
SW-846 8082	11096-82-5	Aroclor-1260	110	110
SW-846 6010	7440-38-2	Arsenic	85	99
SW-846 6010	7440-39-3	Barium	95	104
SW-846 8260	71-43-2	Benzene	82.92	107.9
SW-846 6010	7440-41-7	Beryllium	94	104
SW-846 8260	75-27-4	Bromodichloromethane	79.21	117
SW-846 8260	75-25-2	Bromoform	84.59	122
SW-846 8260	74-83-9	Bromomethane	75.06	116
SW-846 6010	7440-43-9	Cadmium	88	100
SW-846 8260	75-15-0	Carbon Disulfide	69	132.4
SW-846 8260	56-23-5	Carbon Tetrachloride	77.36	123
SW-846 8260	108-90-7	Chlorobenzene	94	122.1
SW-846 8260	75-00-3	Chloroethane	80.09	122.2
SW-846 8260	67-66-3	Chloroform	83.46	116
SW-846 8260	74-87-3	Chloromethane	67.74	126.7

Test Method	CAS Number	Analyte	Minimum Percent Recovery	Maximum Percent Recovery
SW-846 6010	7440-47-3	Chromium	89	102
SW-846 8260	10061-01-5	cis-1,3-Dichloropropene	83.65	111
SW-846 6010	7440-48-4	Cobalt	86	99
SW-846 6010	7440-50-8	Copper	88	101
SW-846 8260	124-48-1	Dibromochloromethane	89.45	120
SW-846 8081	60-57-1	Dieldrin	112	112
SW-846 8081	72-20-8	Endrin	106	106
SW-846 8260	100-41-4	Ethylbenzene	95	121.5
SW-846 8081	58-89-9	gamma-BHC	101	101
SW-846 8081	76-44-8	Heptachlor	110	110
SW-846 8260	87-68-3	Hexachlorobutadiene	89.22	115.1
SW-846 6010	7439-89-6	Iron	93	102
SW-846 6010	7439-92-1	Lead	91	100
SW-846 6010	7439-93-2	Lithium	93	103
SW-846 6010	7439-96-5	Manganese	89	101
SW-846 6010	7439-97-6	Mercury	93	107
SW-846 8260	75-09-2	Methylene chloride	82.4	109.9
SW-846 6010	7439-98-7	Molybdenum	86	100
SW-846 8260	91-20-3	Naphthalene	81	119
SW-846 6010	7440-02-0	Nickel	89	100
SW-846 6010	7782-49-2	Selenium	84	98
SW-846 6010	7440-22-4	Silver	86	100
SW-846 6010	7440-24-6	Strontium	92	102
SW-846 8260	100-42-5	Styrene	95.37	113.5
SW-846 8260	127-18-4	Tetrachloroethene	92.54	111.7
SW-846 6010	7440-31-5	Tin	81	101
SW-846 8260	108-88-3	Toluene	91	116.3
SW-846 8260	10061-02-6	trans-1,3-Dichloropropene	91	120
SW-846 8260	79-01-6	Trichloroethene	79.3	110.5
SW-846 6010	11-09-6	Uranium, Total	92	107
SW-846 6010	7440-62-2	Vanadium	89	101
SW-846 8260	75-01-4	Vinyl chloride	78.08	122
SW-846 8260	1330-20-7	Xylene	95	121.9
SW-846 6010	7440-66-6	Zinc	82	98

Surrogate Evaluation

A summary of surrogate results for IHSS Group 500-3 samples is presented in Table 16. Surrogate frequency was adequate based on at least one set per VOC sample. Surrogates are added to every sample; therefore, surrogate recoveries pertain to individual samples only. Unacceptable surrogate recoveries can indicate matrix effects. The highest and lowest surrogate recoveries for this project were reviewed, and results indicated no adverse impact to project decisions due to matrix effects. All organic compounds

68/

associated with poor surrogate recoveries had maximum concentrations significantly less than WRW ALs.

Table 16
Surrogate Recovery Summary

Number of Samples	CAS Number	Analyte	Minimum Percent Recovery	Maximum Percent Recovery
76	460-00-4	4-Bromofluorobenzene	79	119.4
76	17060-07-0	Deuterated 1,2-dichloroethane	66	126
76	2037-26-5	Deuterated toluene	79	114.8

Field Blank Evaluation

Results of IHSS Group 500-3 field blank analyses are given in Table 17. Detectable contamination in field blanks could indicate cross-contamination of samples if the same contaminant is also detected in the associated real samples. When the real result is less than 10 times the blank result for common laboratory contaminants or 5 times the result for other contaminants, the real result is eliminated. None of the chemicals were detected in the blanks at concentrations greater than one-tenth the AL. Therefore, evaluation of field blank results indicated no cross-contamination that could adversely impact project decisions.

Table 17
Field Blank Summary

Laboratory	CAS Number	Analyte	Sample QC Code	Detected Result	Result Unit
ESTLDEN	78-93-3	2-Butanone	TB	2.2	µg/L
GEL	67-64-1	Acetone	TB	4.6	µg/L
ESTLDEN	67-64-1	Acetone	TB	15	µg/L
ESTLDEN	7429-90-5	Aluminum	RNS	0.3	mg/L
ESTLDEN	7429-90-5	Aluminum	FB	0.03	mg/L
ESTLDEN	7440-36-0	Antimony	FB	0.0036	mg/L
ESTLDEN	7440-39-3	Barium	RNS	0.0022	mg/L
ESTLDEN	7440-39-3	Barium	FB	0.00068	mg/L
ESTLDEN	7440-43-9	Cadmium	FB	0.00059	mg/L
URS	56-23-5	Carbon Tetrachloride	FB	36.2	µg/L
URS	56-23-5	Carbon Tetrachloride	TB	35.6	µg/L
URS	67-66-3	Chloroform	FB	1.7	µg/L
URS	67-66-3	Chloroform	TB	1.7	µg/L
ESTLDEN	7440-48-4	Cobalt	RNS	0.0007	mg/L
ESTLDEN	7440-48-4	Cobalt	FB	0.00068	mg/L
ESTLDEN	7440-50-8	Copper	FB	0.0047	mg/L
ESTLDEN	7440-50-8	Copper	RNS	0.025	mg/L
URS	100-41-4	Ethylbenzene	TB	1.2	µg/L
ESTLDEN	7439-89-6	Iron	FB	0.031	mg/L

69/

Laboratory	CAS Number	Analyte	Sample QC Code	Detected Result	Result Unit
ESTLDEN	7439-89-6	Iron	RNS	0.22	mg/L
ESTLDEN	7439-92-1	Lead	FB	0.003	mg/L
ESTLDEN	7439-92-1	Lead	RNS	0.0043	mg/L
ESTLDEN	7439-93-2	Lithium	FB	0.0019	mg/L
ESTLDEN	7439-93-2	Lithium	RNS	0.0027	mg/L
ESTLDEN	7439-96-5	Manganese	RNS	0.0026	mg/L
ESTLDEN	7439-96-5	Manganese	FB	0.00069	mg/L
ESTLDEN	7439-97-6	Mercury	FB	0.00023	mg/L
ESTLDEN	75-09-2	Methylene chloride	TB	0.26	µg/L
ESTLDEN	7439-98-7	Molybdenum	RNS	0.003	mg/L
URS	91-20-3	Naphthalene	FB	1.4	µg/L
ESTLDEN	91-20-3	Naphthalene	TB	0.6	µg/L
ESTLDEN	7440-02-0	Nickel	FB	0.036	mg/L
ESTLDEN	7440-24-6	Strontium	FB	0.00067	mg/L
ESTLDEN	7440-24-6	Strontium	RNS	0.0068	mg/L
ESTLDEN	7440-31-5	Tin	RNS	0.0089	mg/L
ESTLDEN	108-88-3	Toluene	TB	0.3	µg/L
URS	108-88-3	Toluene	RNS	2	µg/L
URS	108-88-3	Toluene	FB	2.7	µg/L
URS	108-88-3	Toluene	TB	2.1	µg/L
URS	15117-96-1	Uranium-235	FB	0.181	pCi/g
URS	15117-96-1	Uranium-235	RNS	0.191	pCi/g
URS	7440-61-1	Uranium-238	FB	3.38	pCi/g
URS	7440-61-1	Uranium-238	RNS	3.31	pCi/g
URS	1330-20-7	Xylene	RNS	2.5	µg/L
ESTLDEN	7440-66-6	Zinc	FB	0.0055	mg/L
ESTLDEN	7440-66-6	Zinc	RNS	0.018	mg/L

Sample MS Evaluation

The minimum and maximum MS results for IHSS Group 500-3 are summarized by chemical in Table 18. According to EPA data validation guidelines (EPA 1994b), if organic MS recoveries are low, the data reviewer may evaluate the MS and MSD results in conjunction with other QC criteria. For this project, LCS recoveries were reviewed for organic analytes with unacceptably low MS recoveries. For 1,1,2,2-tetrachloroethane, the minimum MS recovery was less than 5 percent, but the LCS recovery was 85%. The LCS result indicated that the laboratory was able to detect the analyte in a matrix free of interferences, but the very low MS recovery suggests that matrix interference was significant in the particular sample that exhibited the low MS recovery, which was collected at CD44-005. A review of individual 1,1,2,2-tetrachloroethane recoveries in all IHSS Group 500-3 MS and MSD samples indicates that recoveries exceeded 90% in half of all MS and MSD samples and exceeded 60% in three-quarters of all MS and MSD samples. Thus the apparent matrix effects on 1,1,2,2-tetrachloroethane appear to be isolated to certain samples and are not pervasive throughout the data set.

For inorganics, the maximum sample result for each analyte was divided by the lowest percent recovery for that analyte. If the resulting number was less than the AL, data quality was sufficient for making project decisions and no further evaluation was required. For this project, all results were acceptable. Low recoveries of antimony, copper, mercury, and manganese did not adversely affect project decisions because the associated RFCA WRW ALs were at least two times greater than the highest sample result.

Table 18
Sample MS Evaluation Summary

Test Method	CAS Number	Analyte	Minimum Percent Recovery	Maximum Percent Recovery	Number of Samples	Number of Lab Batches
SW-846 8260	71-55-6	1,1,1-Trichloroethane	82	108.7	12	12
SW-846 8260	79-34-5	1,1,2,2-Tetrachloroethane	3.039	143.4	12	12
SW-846 8260	79-00-5	1,1,2-Trichloroethane	83	108.8	12	12
SW-846 8260	75-34-3	1,1-Dichloroethane	80	107.8	12	12
SW-846 8260	75-35-4	1,1-Dichloroethene	89	113.8	12	12
SW-846 8260	120-82-1	1,2,4-Trichlorobenzene	32.01	90	12	12
SW-846 8260	95-50-1	1,2-Dichlorobenzene	72.76	97.13	12	12
SW-846 8260	107-06-2	1,2-Dichloroethane	82	117	12	12
SW-846 8260	78-87-5	1,2-Dichloropropane	82	111.2	12	12
SW-846 8260	106-46-7	1,4-Dichlorobenzene	74	97.51	12	12
SW-846 8260	78-93-3	2-Butanone	72.73	135.8	12	12
SW-846 8081	50-29-3	4,4'-DDT	122	122	1	1
SW-846 8260	108-10-1	4-Methyl-2-pentanone	83	109	12	12
SW-846 8260	67-64-1	Acetone	52.44	178.6	12	12
SW-846 8081	309-00-2	Aldrin	99	99	1	1
SW-846 6010	7429-90-5	Aluminum	1290	5110	7	7
SW-846 6010	7440-36-0	Antimony	36	75	7	7
SW-846 8082	12674-11-2	Aroclor-1016	90	90	1	1
SW-846 8082	11096-82-5	Aroclor-1260	115	115	1	1
SW-846 6010	7440-38-2	Arsenic	88	95	7	7
SW-846 6010	7440-39-3	Barium	93	108	7	7
SW-846 8260	71-43-2	Benzene	85	103	12	12
SW-846 6010	7440-41-7	Beryllium	89	106	7	7
SW-846 8260	75-27-4	Bromodichloromethane	79.56	107.5	12	12
SW-846 8260	75-25-2	Bromoform	80.94	111.8	12	12
SW-846 8260	74-83-9	Bromomethane	79	133.4	12	12
SW-846 6010	7440-43-9	Cadmium	87	98	7	7
SW-846 8260	75-15-0	Carbon Disulfide	57	86.79	12	12
SW-846 8260	56-23-5	Carbon Tetrachloride	81.18	107.3	12	12
SW-846 8260	108-90-7	Chlorobenzene	80.26	136.2	12	12
SW-846 8260	75-00-3	Chloroethane	82	112.2	12	12
SW-846 8260	67-66-3	Chloroform	84	107.1	12	12
SW-846 8260	74-87-3	Chloromethane	87	140	12	12

71/

Test Method	CAS Number	Analyte	Minimum Percent Recovery	Maximum Percent Recovery	Number of Samples	Number of Lab Batches
SW-846 6010	7440-47-3	Chromium	100	560	7	7
SW-846 8260	10061-01-5	cis-1,3-Dichloropropene	81.53	104	12	12
SW-846 6010	7440-48-4	Cobalt	74	114	7	7
SW-846 6010	7440-50-8	Copper	0	211	7	7
SW-846 8260	124-48-1	Dibromochloromethane	74.54	103.1	12	12
SW-846 8081	60-57-1	Dieldrin	102	102	1	1
SW-846 8081	72-20-8	Endrin	99	99	1	1
SW-846 8260	100-41-4	Ethylbenzene	79.37	125.7	12	12
SW-846 8081	58-89-9	gamma-BHC	111	111	1	1
SW-846 8081	76-44-8	Heptachlor	97	97	1	1
SW-846 8260	87-68-3	Hexachlorobutadiene	31.49	87	12	12
SW-846 6010	7439-89-6	Iron	703	2290	7	7
SW-846 6010	7439-92-1	Lead	92	98	7	7
SW-846 6010	7439-93-2	Lithium	91	107	7	7
SW-846 6010	7439-96-5	Manganese	0	235	7	7
SW-846 6010	7439-97-6	Mercury	22	98	7	7
SW-846 8260	75-09-2	Methylene chloride	85	106	12	12
SW-846 6010	7439-98-7	Molybdenum	87	95	7	7
SW-846 8260	91-20-3	Naphthalene	54.85	90	12	12
SW-846 6010	7440-02-0	Nickel	89	175	7	7
SW-846 6010	7782-49-2	Selenium	87	93	7	7
SW-846 6010	7440-22-4	Silver	89	100	7	7
SW-846 6010	7440-24-6	Strontium	89	105	7	7
SW-846 8260	100-42-5	Styrene	80.57	116.3	12	12
SW-846 8260	127-18-4	Tetrachloroethene	67.45	98.86	12	12
SW-846 6010	7440-31-5	Tin	82	91	7	7
SW-846 8260	108-88-3	Toluene	80	98.01	12	12
SW-846 8260	10061-02-6	trans-1,3-Dichloropropene	78.69	108	12	12
SW-846 8260	79-01-6	Trichloroethene	87	165.4	12	12
SW-846 6010	11-09-6	Uranium, Total	93	100	7	7
SW-846 6010	7440-62-2	Vanadium	99	114	7	7
SW-846 8260	75-01-4	Vinyl chloride	77	114.5	12	12
SW-846 8260	1330-20-7	Xylene	78.24	115.3	12	12
SW-846 6010	7440-66-6	Zinc	93	386	7	7

13.2.2 Precision

Precision is measured by evaluating both MSDs and field duplicates, as described in the following sections.

Sample MSD Evaluation

Laboratory precision is evaluated by computing the maximum relative percent differences (RPDs) between MS and MSD samples for each analyte, as summarized in

72/

Table 19. Analytes with the highest relative percent differences (RPDs) were reviewed by comparing the highest sample result to the RFCA WRW AL. For analytes with RPDs greater than 35 percent, if the highest sample concentrations were sufficiently below the AL, no further evaluation is needed. Review of analytes listed in Table 19 with an RPD greater than 35 percent indicated no adverse impact to project decisions.

Table 19
Sample MS-MSD RPD Summary

Test Method	CAS	Analyte	Maximum RPD
SW-846 8260	71-55-6	1,1,1-Trichloroethane	19.368
SW-846 8260	79-34-5	1,1,2,2-Tetrachloroethane	86.173
SW-846 8260	79-00-5	1,1,2-Trichloroethane	9.326
SW-846 8260	75-34-3	1,1-Dichloroethane	14.778
SW-846 8260	75-35-4	1,1-Dichloroethene	19.053
SW-846 8260	120-82-1	1,2,4-Trichlorobenzene	32.868
SW-846 8260	95-50-1	1,2-Dichlorobenzene	12.155
SW-846 8260	107-06-2	1,2-Dichloroethane	15.020
SW-846 8260	78-87-5	1,2-Dichloropropane	15.228
SW-846 8260	106-46-7	1,4-Dichlorobenzene	9.825
SW-846 8260	78-93-3	2-Butanone	22.764
SW-846 8081	50-29-3	4,4'-DDT	7.660
SW-846 8260	108-10-1	4-Methyl-2-pentanone	16.034
SW-846 8260	67-64-1	Acetone	23.077
SW-846 8081	309-00-2	Aldrin	5.181
SW-846 6010	7429-90-5	Aluminum	113.653
SW-846 6010	7440-36-0	Antimony	22.727
SW-846 8082	12674-11-2	Aroclor-1016	30.986
SW-846 8082	11096-82-5	Aroclor-1260	3.540
SW-846 6010	7440-38-2	Arsenic	5.464
SW-846 6010	7440-39-3	Barium	11.659
SW-846 8260	71-43-2	Benzene	16.708
SW-846 6010	7440-41-7	Beryllium	27.184
SW-846 8260	75-27-4	Bromodichloromethane	15.247
SW-846 8260	75-25-2	Bromoform	28.295
SW-846 8260	74-83-9	Bromomethane	18.391
SW-846 6010	7440-43-9	Cadmium	6.383
SW-846 8260	75-15-0	Carbon Disulfide	17.964
SW-846 8260	56-23-5	Carbon Tetrachloride	21.856
SW-846 8260	108-90-7	Chlorobenzene	28.523
SW-846 8260	75-00-3	Chloroethane	18.378
SW-846 8260	67-66-3	Chloroform	15.525
SW-846 8260	74-87-3	Chloromethane	20.559
SW-846 6010	7440-47-3	Chromium	133.333
SW-846 8260	10061-01-5	cis-1,3-Dichloropropene	13.198
SW-846 6010	7440-48-4	Cobalt	15

73/

Test Method	CAS	Analyte	Maximum RPD
SW-846 6010	7440-50-8	Copper	200
SW-846 8260	124-48-1	Dibromochloromethane	10.628
SW-846 8081	60-57-1	Dieldrin	6.061
SW-846 8081	72-20-8	Endrin	6.25
SW-846 8260	100-41-4	Ethylbenzene	26.008
SW-846 8081	58-89-9	gamma-BHC	13.462
SW-846 8081	76-44-8	Heptachlor	3.0457
SW-846 8260	87-68-3	Hexachlorobutadiene	45.580
SW-846 6010	7439-89-6	Iron	200
SW-846 6010	7439-92-1	Lead	8.780
SW-846 6010	7439-93-2	Lithium	5.769
SW-846 6010	7439-96-5	Manganese	70.423
SW-846 6010	7439-97-6	Mercury	58.065
SW-846 8260	75-09-2	Methylene chloride	16.216
SW-846 6010	7439-98-7	Molybdenum	5.405
SW-846 8260	91-20-3	Naphthalene	22.917
SW-846 6010	7440-02-0	Nickel	56.410
SW-846 6010	7782-49-2	Selenium	5.525
SW-846 6010	7440-22-4	Silver	6.383
SW-846 6010	7440-24-6	Strontium	10
SW-846 8260	100-42-5	Styrene	20.495
SW-846 8260	127-18-4	Tetrachloroethene	21.313
SW-846 6010	7440-31-5	Tin	5.848
SW-846 8260	108-88-3	Toluene	10.701
SW-846 8260	10061-02-6	trans-1,3-Dichloropropene	14.074
SW-846 8260	79-01-6	Trichloroethene	31.076
SW-846 6010	11-09-6	Uranium, Total	6.316
SW-846 6010	7440-62-2	Vanadium	68.966
SW-846 8260	75-01-4	Vinyl chloride	17.978
SW-846 8260	1330-20-7	Xylene	24.058
SW-846 6010	7440-66-6	Zinc	13.333

Field Duplicate Evaluation

Field duplicate results reflect sampling precision, or the overall repeatability of the sampling process. The frequency of field duplicate collection should exceed 1 field duplicate per 20 real samples, or 5 percent. This goal is applied to the overall ER project and not on a specific IHSS Group basis.

Table 20 indicates field duplicate frequencies were slightly below 5 percent for radionuclides analyzed by gamma spectroscopy. Frequencies were zero for pesticides (SW-846 8081), PCBs (SW-846 8082), and herbicides (SW-846 8151A); however, this is expected because only two IHSS Group 500-3 samples were analyzed using each of these methods.

Table 20
Field Duplicate Sample Frequency Summary

Test Method	Number of Real Samples	Number of Duplicate Samples	Percent Duplicate Samples
Alpha spectroscopy	22	3	13.0 %
Gamma spectroscopy	116	5	4.3 %
SW-846 6010	71	5	7.0 %
SW-846 6200	7	1	14.3 %
SW-846 8081	2	0	0 %
SW-846 8082	2	0	0 %
SW-846 8151A	2	0	0 %
SW-846 8260	76	5	6.6 %

The field duplicate RPD values indicate how much variation exists in the field duplicate analytical results obtained from analyzing samples collected at the same time and from the same location and depth. EPA data validation guidelines state "there are no required review criteria for field duplicate analyses comparability" (EPA 1994b). For the DQA, the highest RPD values were reviewed (Table 21), and no adverse impact on project decisions was indicated.

Table 21
Field Duplicate RPD Evaluation Summary

Lab Code	Test Method	Analyte	Maximum RPD
ESTLDEN	SW-846 6010	Aluminum	40.00
ESTLDEN	SW-846 6010	Arsenic	39.25
ESTLDEN	SW-846 6010	Barium	35.90
ESTLDEN	SW-846 6010	Beryllium	57.89
ESTLDEN	SW-846 6010	Chromium	41.51
ESTLDEN	SW-846 6010	Cobalt	37.50
URS	SW-846 6200	Cobalt	0.00
ESTLDEN	SW-846 6010	Copper	38.55
ESTLDEN	SW-846 6010	Iron	18.18
URS	SW-846 6200	Iron	7.90
ESTLDEN	SW-846 6010	Lead	33.33
ESTLDEN	SW-846 6010	Lithium	46.15
ESTLDEN	SW-846 6010	Manganese	37.84
ESTLDEN	SW-846 6010	Mercury	16.09
ESTLDEN	SW-846 6010	Nickel	40.00
URS	SW-846 6200	Nickel	2.99
URS	SW-846 6200	Strontium	7.68
ESTLDEN	SW-846 6010	Strontium	42.42
ESTLDEN	SW-846 6010	Tin	35.15
GEL	ALPHA SPEC	Uranium-234	29.28
GEL	ALPHA SPEC	Uranium-238	35.00

Lab Code	Test Method	Analyte	Maximum RPD
ESTLDEN	SW-846 6010	Vanadium	32.26
ESTLDEN	SW-846 6010	Zinc	38.46

13.2.3 Completeness

Based on original project DQOs, a minimum of 25 percent of ER Program analytical (and radiological) results must be formally verified and validated. Of that percentage, no more than 10 percent of the results may be rejected, which ensures that analytical laboratory practices are consistent with quality requirements. The number and percentage of validated records (codes without "1"), the number and percentage of verified records (codes with "1"), and the percentage of rejected records for each analyte group for this project are listed in Table 22.

Table 22
Validation and Verification Summary

Validation Qualifier Code	Total Number of Records	Number of Records by Test Method						
		Alpha Spectroscopy	Gamma Spectroscopy	SW-846 6010	SW-846 6200	SW-846 8081	SW-846 8082	SW-846 8260
None	2	0	2	0	0	0	0	0
I	4	0	4	0	0	0	0	0
J	96	0	0	91	4	0	0	1
J1	226	5	0	201	17	0	0	3
JB	9	0	0	0	0	0	0	9
JB1	8	0	0	0	0	0	0	8
R	1	0	0	0	1	0	0	0
U	2	0	0	0	0	0	0	2
UJ	31	0	0	19	4	0	0	8
UJ1	100	0	0	74	7	0	0	19
V	1449	0	72	396	29	0	0	952
V1	3231	110	272	852	71	34	14	1878
Total	5159	115	350	1633	133	34	14	2880
Validated	1588	0	72	506	38	0	0	972
%Validated	30.8%	0.0%	20.6%	31.0%	28.6%	0.0%	0.0%	33.8%
Verified	3569	115	276	1127	95	34	14	1908
%Verified	69.2%	100.0%	78.9%	69.0%	71.4%	100.0%	100.0%	66.3%
Rejected	1	0	0	0	1	0	0	0
%Rejected	0.02%	0.00%	0.00%	0.00%	0.75%	0.00%	0.00%	0.00%

Out of 5,159 total results, one metal result was rejected (0.02 percent). The rejection of this record did not affect project decisions. For this project, 30.8 percent of the analyses were validated. However, less than 25 percent of results for alpha spectroscopy, gamma

spectroscopy, SW-846 8081 (pesticides), and SW-846 8082 (PCBs), were validated. This is below Program requirements; however, the overall ER Program V&V goal of 25 percent is being met.

13.2.4 Sensitivity

RLs, in units of micrograms per kilogram ($\mu\text{g/kg}$) for organics, milligrams per kilogram (mg/kg) for metals, and pCi/g for radionuclides, were compared with RFCA WRW ALs. Adequate sensitivities of analytical methods were attained for all COCs that affect remediation decisions. "Adequate" sensitivity is defined as an RL less than an analyte's associated AL, typically less than one-half the AL.

13.3 Summary of Data Quality

RPDs greater than 35 percent indicate the sampling precision limits of some analytes have been exceeded. Also, IHSS Group 500-3 validation percentages for pesticides, PCBs, and radionuclides were below 25 percent; however, the ER Program V&V goal of 25 percent is being met. Data collected and used for accelerated action at IHSS Group 500-3 are adequate for decision making.

14.0 CONCLUSIONS

Results of the accelerated action justify an NFAA determination for IHSS Group 500-3. This justification is based on the following:

- No additional accelerated action is required based on surface soil characterization and confirmation sample data, because there are no longer any WRW AL exceedances in surface soil or subsurface soil.
- No additional accelerated action is required based on the SSRS, as described in Section 7.0.
- No additional accelerated action is required based on the stewardship evaluation, as described in Section 8.0

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27/

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78/

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79/

**APPENDIX A
CORRESPONDENCE**

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

ER REGULATORY CONTACT RECORD

Date/Time: August 5, 2004 / 1515

Site Contact(s): Annette Primrose Norma Castaneda
Phone: 303 966-9883 303 966-4226

Regulatory Contact: Harlen Ainscough
Phone: 303 692-3337
Agency: CDPHE

Purpose of Contact: Modifications to the 500-3 Sampling and Analysis Plan Addendum

Discussion

As described in the IA SAP Addendum #IA-03-12 for 500-3, sample location CD43-010 is in the subsurface Building 561. Based on recent experience coring through subsurface structures, only a water sample is anticipated to be collected. Therefore, it is agreed that this location will be moved outside but as close to the building as possible. Samples will be collected from the depth-adjusted intervals that were to be collected inside the building.

Contact Record Prepared By: Annette Primrose

Required Distribution:

M. Aguilar, USEPA
H. Ainscough, CDPHE
S. Bell, DOE-RFPO
J. Berardini, K-H
B. Birk, DOE-RFPO
L. Brooks, K-H ESS
L. Butler, K-H RISS
G. Carnival, K-H RISS
N. Castaneda, DOE-RFPO
C. Deck, K-H Legal
N. Demos, SSOC
S. Gunderson, CDPHE
M. Keating, K-H RISS
G. Kleeman, USEPA
D. Kruchek, CDPHE
J. Legare, DOE-RFPO

D. Mayo, K-H RISS
J. Mead, K-H ESS
S. Nesta, K-H RISS
L. Norland, K-H RISS
K. North, K-H ESS
E. Pottorff, CDPHE
A. Primrose, K-H RISS
R. Schassburger, DOE-RFPO
S. Serreze, K-H RISS
D. Shelton, K-H ESS
C. Spreng, CDPHE
S. Surovchak, DOE-RFPO
J. Walstrom, K-H RISS
K. Wiemelt, K-H RISS
C. Zahm, K-H Legal

Additional Distribution:

Karen Maley, K-H RISS
Sherry Lopez, K-H RISS
Sam Garcia, USEPA
Nan Elzinga, URS
Tom Hanson, URS

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

ER REGULATORY CONTACT RECORD

Date/Time: April 14, 2005, 10:30

Site Contact(s): Annette Primrose Norma Castaneda
Phone: 966-4385 966-4226

Regulatory Contact: David Kruchek
Phone: 303 692-3328

Agency: CDPHE

Purpose of Contact: Backfill of B559 Remediation Areas

Discussion

After removal of the process waste line in this area, the hotspot around sample location CD44-005 was excavated in an area approximately 20 by 24 feet and 4 ½ feet deep. Screening results from the bottom and sides of the excavation are all very low, well below action levels. Therefore, this area will be backfilled at risk, pending final analytical results.

A previous, hot spot associated with the process waste lines but nearer to the air tunnel was already backfilled. This area was approximately 6 feet deep, and had low levels of contamination slightly above the action levels prior to excavation. Screening results at this location were below action levels. This hotspot was backfilled at risk, pending final analytical results, to allow continued work on removal of the B559 structures.

An additional approximately two feet of soil was removed from the base of the excavation for the OPWL manway between 528 Pit and Building 559. The excavation is now approximately 9 feet deep. The screening level sample result for this excavation was far below action levels.

Contact Record Prepared By: Annette Primrose

Required Distribution:

M. Aguilar, USEPA
H. Ainscough, CDPHE
J. Berardini, K-H
B. Birk, DOE-RFPO
L. Brooks, K-H ESS
G. Carnival, K-H RISS
N. Castaneda, DOE-RFPO
C. Deck, K-H Legal
N. Demos, SSOC
S. Garcia, USEPA
S. Gunderson, CDPHE
S. Johnson, K-H ESS
M. Keating, K-H RISS
L. Kimmel, USEPA
D. Kruchek, CDPHE

J. Legare, DOE-RFPO
D. Mayo, K-H RISS
S. Nesta, K-H RISS
L. Norland, K-H RISS
E. Pottorff, CDPHE
A. Primrose, K-H RISS
M. Roy, DOE-RFPO
R. Schassburger, DOE-RFPO
S. Serreze, K-H RISS
D. Shelton, K-H ESS
C. Spreng, CDPHE
S. Surovchak, DOE-RFPO
J. Walstrom, K-H RISS
K. Wiemelt, K-H RISS
C. Zahm, K-H Legal

Additional Distribution:

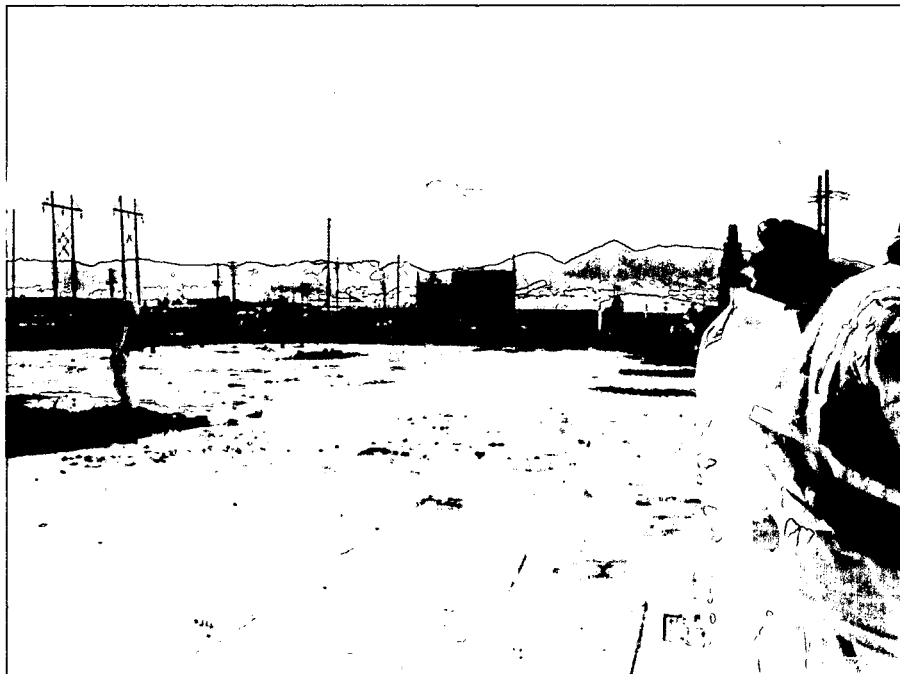
K. Maley, K-H RISS
G. Pudlik, K-H RISS
R. Ferrera, K-H RISS

**APPENDIX B
PROJECT PHOTOGRAPHS**

**APPENDIX B
PROJECT PHOTOGRAPHS**



Excavation of Room 130 hot spot with Building 559 slab in place.



Building 559 slab during initial excavation of Room 130 hot spot.



Partially excavated manway between Buildings 528 and 559.



Removal of asphalt mixed with gravel during Building 559 D&D.



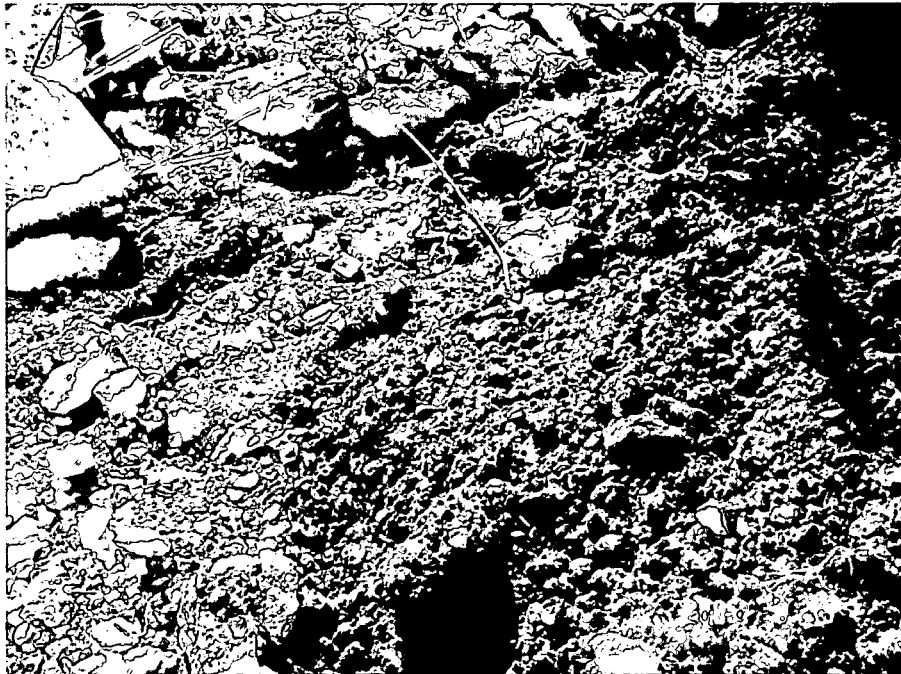
Pipe stub exposed during Building 559 excavation.



Workers look for shards of Pyrex released by breaking of Pyrex OPWL during removal.



Pyrex shard generated by breaking of Pyrex OPWL during removal.



Scattering of Pyrex shards generated by breaking Pyrex OPWL lines during removal.



Scattering of Pyrex shards generated by breaking Pyrex OPWL lines during removal.

ENCLOSURE

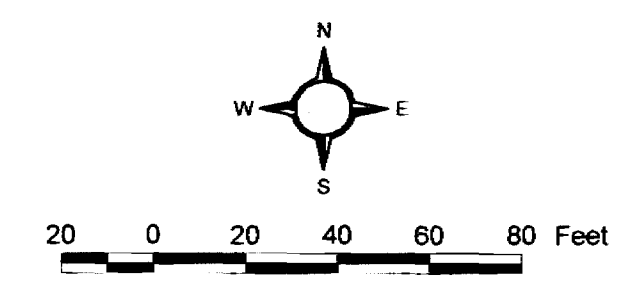
**COMPACT DISC
IHSS GROUP 500-3
ACCELERATED ACTION DATA**

Figure 3
IHSS Group 500-3
Surface Soil Results Greater
Than RLs or Background Means
Plus Two Standard Deviations

KEY

- Sampling location with results greater than WRW AL
 - Sampling location with results greater than RLs or background means plus two standard deviations
 - Sampling location with all results less than RLs or background means plus two standard deviations
- Original Process Waste Lines
New Process Waste Lines
UBCs 559 and 528
IHSS 159
Demolished Building
Standing Building
Asphalt
Dirt Roads
Building 559 Floor Plan

DRAFT



Scale 1:500

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Date: 06/15/05

Prepared by: RADMS

Prepared for: KAISER HILL COMPANY

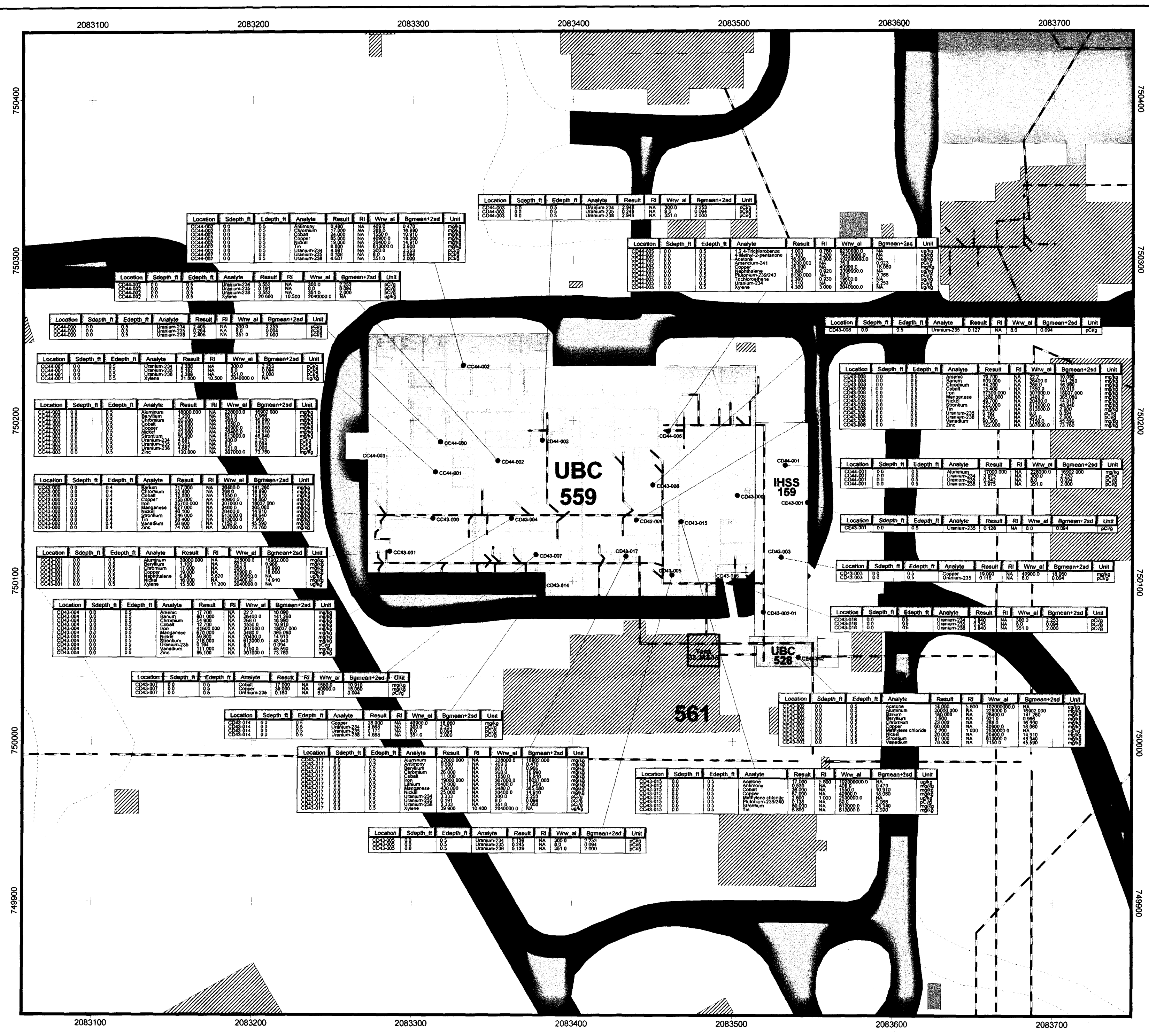
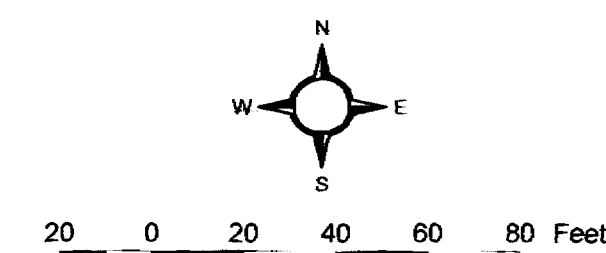


Figure 4
IHSS Group 500-3
Subsurface Soil Results Greater
Than RLs or Background Means
Plus Two Standard Deviations
UBC 559

KEY

- Sampling location with results greater than WRW AL
- Sampling location with results greater than RLs or background means plus two standard deviations
- Sampling location with all results less than RLs or background means plus two standard deviations
- Original Process Waste Lines
- New Process Waste Lines
- UBCs 559 and 528
- IHSS 159
- Demolished Building
- Standing Building
- Asphalt
- Dirt Roads
- Building 559 Floor Plan

DRAFT



Scale 1:500

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Date: 06/15/05

Prepared by:

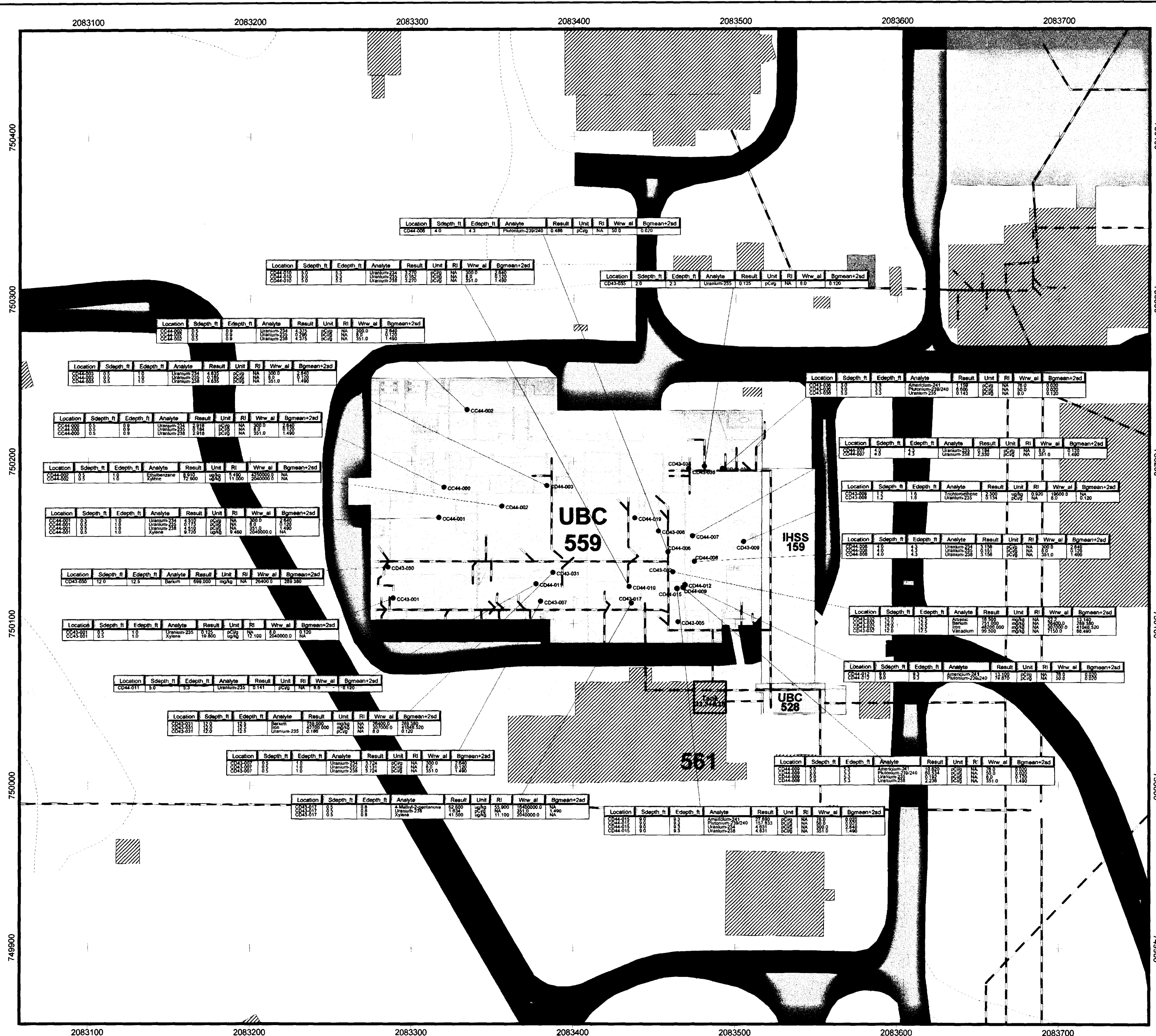


Prepared for:



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IA-A-002725



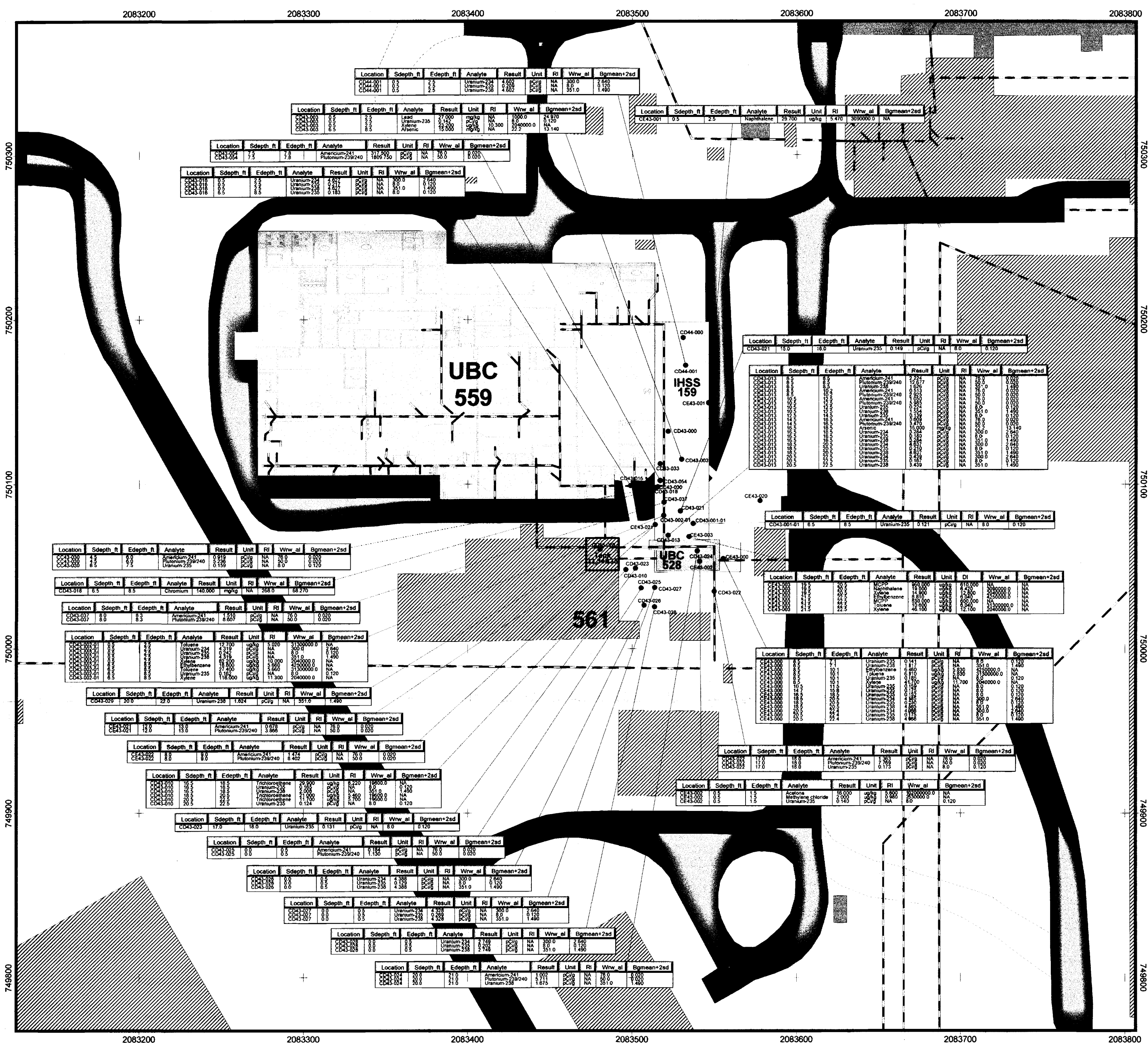


Figure 5
IHSS Group 500-3
Subsurface Soil Results Greater
Than RLs or Background Means
Plus Two Standard Deviations
Outside of UBC 559

KEY

- Sampling location with results greater than WRW AL
- Sampling location with results greater than RLs or background means plus two standard deviations
- Sampling location with all results less than RLs or background means plus two standard deviations
- Original Process Waste Lines
- New Process Waste Lines
- UBCs 559 and 528
- IHSS 159
- Demolished Building
- Standing Building
- Asphalt
- Dirt Roads
- Building 559 Floor Plan

DRAFT

N
W E
S

20 0 20 40 60 80 Feet

Scale 1:500

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Date: 06/15/05

Prepared by: RADMS

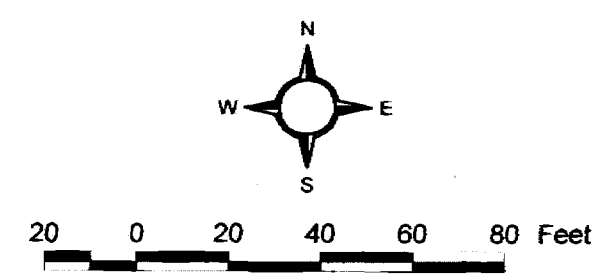
Prepared for: KAISER HILL COMPANY

Figure 9
IHSS Group 500-3 Residual
Subsurface Soil Contamination
Greater Than RLs or
Background Means Plus Two
Standard Deviations
UBC 559

KEY

- Sampling location with results greater than RLs or background means plus two standard deviations
 - Sampling location with all results less than RLs or background means plus two standard deviations
- UBCs 559 and 528
IHSS 159
Demolished Building
Standing Building
Asphalt
Dirt Roads
Building 559 Floor Plan

DRAFT



Scale 1:500

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Date: 06/15/05

Prepared by:

Prepared for:

KAISER-HILL
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